

AUTOMOTIVE INDUSTRIES

LAND — AIR — WATER

SEPTEMBER 17, 1938

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Grinding



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PHILADELPHIA, PA., U. S. A.

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2. SUNOCO reduces the wheel cost per piece ground, because of fewer redressings required.
3. SUNOCO assures uniform abrasive action with clean cuts.
4. SUNOCO prevents distortion and maintains accuracy.
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Seventy-one mechanical and structural die castings in a $12\frac{1}{2}" \times 11\frac{3}{4}" \times 9\frac{1}{4}"$ space—compactness to the *nth* degree! The flexibility of the die casting process for successful product design is typified by this new time recorder.

An examination of the ZINC Alloy Die Castings, shown below, will reveal an amazing ingenuity of design for compactness—1 part where there would ordinarily be 3 or 4—thin sections of exacting uniformity for closer clearances between operating parts—unusual shapes to utilize every available inch of space. Actually, there is an important reduction in number of parts over the preceding model, and additional savings through the elimination of machining and assembling operations.

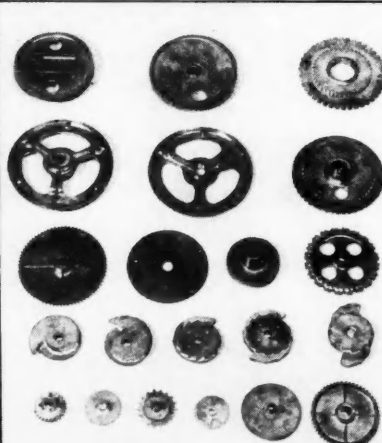
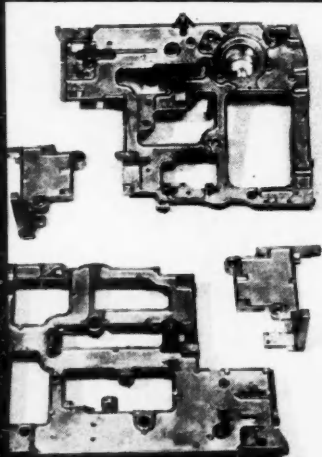
The possibilities of ZINC Alloy Die Castings provide a tool of constantly growing importance to design engineers in many industries. Whether you have an immediate production problem or not, you owe it to yourself to be acquainted with this versatile metal and method. Consult any commercial die caster—or write to The New Jersey Zinc Company, 160 Front Street, New York City.



ZINC

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AUTOMOTIVE INDUSTRIES

AUTOMOBILE

Reg. U. S. Pat. Off.
Published Weekly

Volume 79

Number 12

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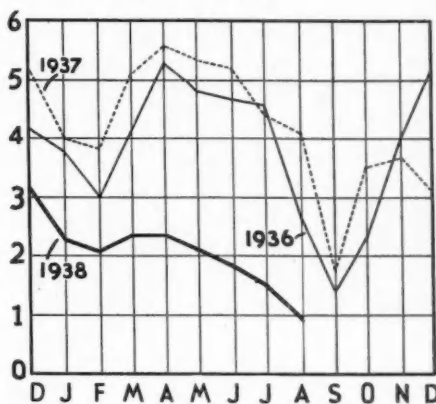
(Advertisement)

AUTOMOTIVE PRODUCTION*

Passenger Cars and Trucks —U. S. and Canada

Bar charts at the right represent total production to August 31st of year indicated.

Numbers at left of monthly graph below show production in 100,000's.



Ideas in Zinc

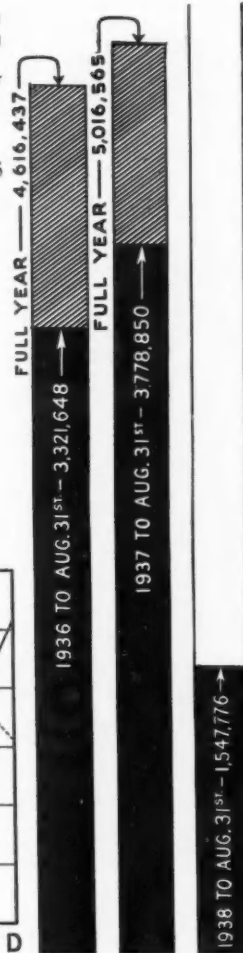
Not in years have so many important changes been made in the appearance of automobiles. Styling will be the predominating theme in '39 sales talks and prominent in the styling picture will be the many details executed in zinc alloy die castings.

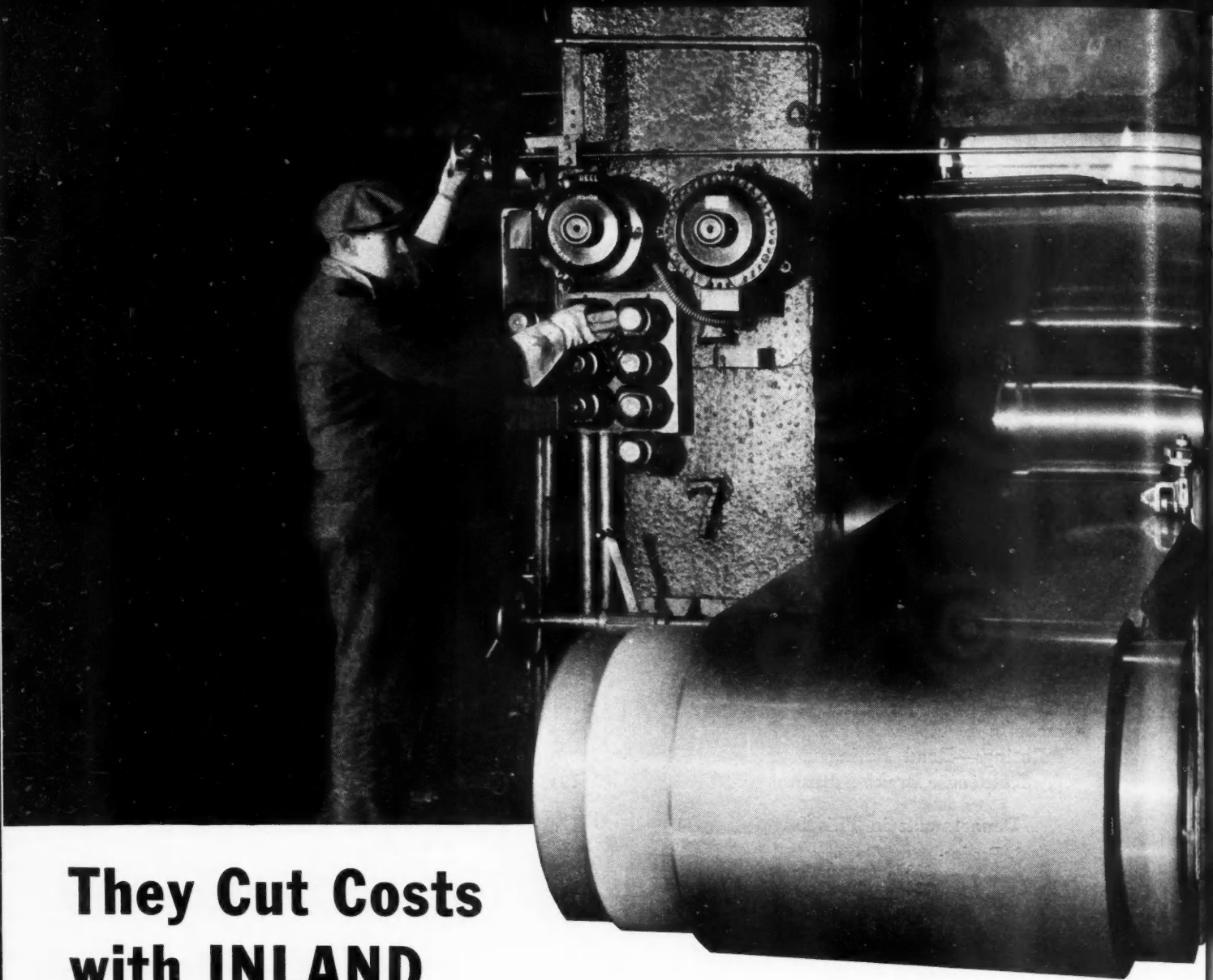
The big, handsome die cast radiator grilles that have graced front ends for a number of years give way to a new styling motif—many following the beautifully modeled front end of the Lincoln-Zephyr. With this trend, we shall note an increasing number of low mounted twin grille zinc alloy panels die cast in gracefully curved contours.

Interior and exterior hardware will continue as versatile and enduring zinc alloy die castings, harmonizing with the new styling and promising some novelties in color finish. Radiator ornaments take on a new function as latches for the hood. And, in many cases, the ornament will set off a long hood center molding, also die cast in zinc alloy.

As engineers look over the new die castings they will appreciate the latitude attained by the process in recent years—castings of exceeding intricacy—of large size and bulk—of fine detail and slender section—and most important from an engineer's viewpoint, castings of outstanding physical strength and durability. All of these desirable characteristics have been made possible through the availability of the Zamak alloys, based on Horse Head Special ZINC of 99.99+ % purity. The New Jersey Zinc Company, 160 Front Street, New York City.

Idea No. 17

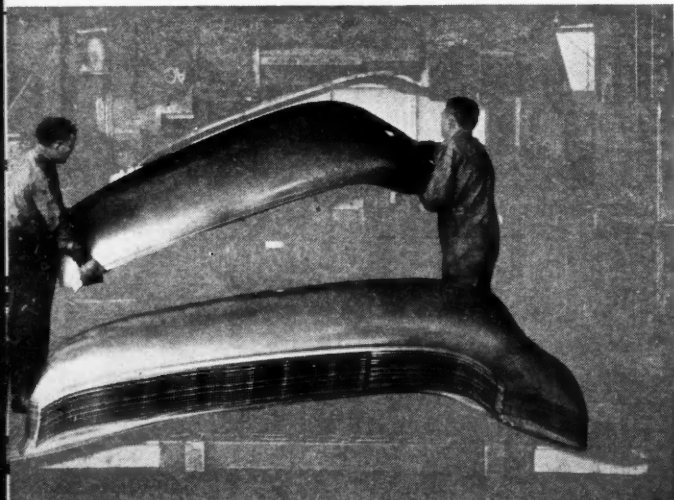




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Apply these four advantages to your own requirements for workable sheets of proper finish. Our personal interest in serving you will make them highly worth while.

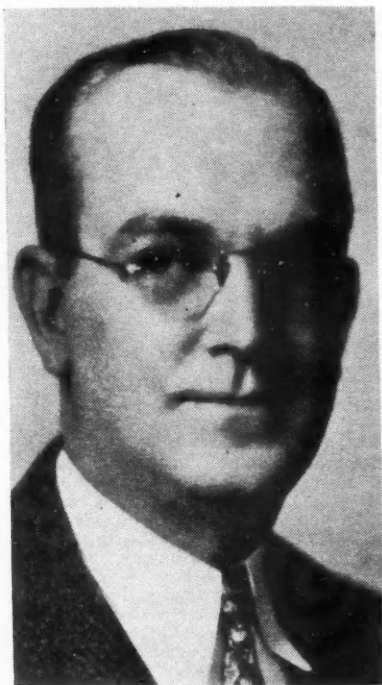


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SHEETS STRIP TIN PLATE BARS PLATES FLOOR PLATES
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AUTOMOTIVE INDUSTRIES



MORRIS M. ROBERTS

... whose appointment as retail merchandising manager of the Nash Motors division of Nash-Kelvinator Corp. has been announced. Mr. Roberts goes to Nash from the Hudson Motor Car Co. where he has been sales promotion manager for the past five years.

Production

Output Estimate at 14,750 Units for This Week

Although estimated car and truck production for the week ending September 17 will present a lower numerical total than during the week immediately preceding, the industry's record currently nevertheless indicates further progress in its approach to all-around production of 1939 models.

Up to the current week production has included a fairly large proportion of 1938 models, chiefly because of the continued operations by Ford, who remained active on these models until September 9. Except for some trucks and a small number of '38 passenger cars still in production for export, the current estimate covers 1939 models entirely.

The week's output is estimated at 14,750 cars and trucks, to which the principal contributors were Plymouth and Buick, although Packard, Studebaker and Pontiac also participated in comparatively larger volume. At least five other producers were expected to get under way by next week.

Chevrolet joined the ranks of those under way, although its operations represented a small part of what may be expected in later weeks. Producers now under way on final assembly of 1939 models include Chevrolet, Pontiac, Buick, Plymouth, Packard, and Studebaker. Practically all production in each instance is for purposes of supplying dealer organizations with initial stocks so they will be prepared for public announcements which, in most instances, are a month or more away.

Plymouth, which already has been announced locally in Detroit and New York, becomes the first producer to make its nation-wide public announcement through its dealers on September 18.—J. A. L.

Briggs Plant Closed by Strike

Discharge of a union steward and three other workers on the gun welding line in the framing department at Briggs Mfg. Co., Detroit, led to a strike which closed the plant on Sept. 14 and threatened employment of more than 15,000 workers.

In addition to 9000 employees in the Briggs plant engaged in production of bodies for the 1939 Plymouth cars, between 6000 and 7000 men in the Plymouth division of Chrysler Corp. were affected on Sept. 15 as the supply of available bodies was not expected to last more than three hours.

Emil Mazey, president of the Briggs local of the United Automobile Workers, charged that the company had attempted to speed up production from 45 to 60 units per day. Company officials vehemently denied the speed up, indicating that the rate had been changed from 45 to 50 units but that additional men had been added so that there was no increase in the work required of any

(Turn to page 336, please)

AUTOMOTIVE INDUSTRIES

Summary of Automotive Production Activity (Week Ending Sept. 17)

BUSES Little change in activity. Operations remain at the 50 to 65 per cent "normal" level with no indication of immediate increase or falling-off. One large producer recently operating about 65 per cent of normal reports 10 per cent boost in production activity this week with good outlook.

TRUCKS One major producer, now under way on preparations for new models, reports that it underestimated current market with result that cleanups will be entirely out of the picture. Another large producer reports sales activity for August ahead of July and ahead of August last year.

TRACTORS Little change in operations with reports varying from "good" to "poor" throughout the industry.

MARINE ENGINES One producer expects export activity to begin within next few weeks and pick-up in domestic situation about the middle of November. Same producer reports current business 10 per cent below last year in units and five per cent ahead in dollar volume of gasoline engines. New line of six water and air-cooled gasoline engines of small inboard type announced by another manufacturer.

AIRCRAFT ENGINES Peak capacities continue on large engines. Market for engines for small pleasure craft has held up beyond expectations, although operations currently are lower than last month. Increase expected with upswing in general business.

This summary is based on confidential information of current actual production rates from leading producers in each field covered. Staff members in Detroit, Chicago, New York and Philadelphia collect the basic information, in all cases from official factory sources.

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Automotive News from Tokyo

Japan Formulates Four-Year Auto Production Plan— High-Speed Diesels to be Standardized

A four-year plan calling for a 400 per cent increase in motorcar production is being formulated by the Cabinet Planning Board in Tokyo. Japanese authorities point out that Japan is still lagging behind the Soviet Union in the production of large vehicles and engines which can be put to military use. There are only two Japanese-owned firms in Japan which qualify for special government protection because their capacities are in excess of 3000 units a year, the minimum limit set by the Automobile Industry Control Law. The bulk of the large military requirements at present is being supplied by the Japanese branches of Ford and General Motors, and since their output is restricted under the Automobile Industry Control Law, an additional supply of imported vehicles must be drawn upon.

The Four-Year Plan aims at making Japan completely independent of foreign automobiles. The main problems now confronting the planners are how to secure the huge amounts of machines and raw materials required for a successful completion of the scheme. The possibility is seen that Tokyo will try to overcome these obstacles by placing the automobile industry under a kind of import-export "link" system, such as applied to the cotton industry. This means that automobile manufacturers will be compelled to provide the necessary exchange for machinery and raw material imports by exporting cars

to overseas markets. More specifically, they will export bantam cars and automobile parts, for which there is believed to be a large market abroad, and buy with the available exchange materials for construction of large cars, with which the Japanese market is insufficiently supplied.

Diesels to be Standardized

At the request of the Army, the Department of Commerce and Industry, Tokyo, will require all builders of high-speed Diesel engines to standardize their designs. It is further learned that the Ikegai models have been selected to serve as standard type, after a plan has fallen through, owing to patent and other difficulties, to develop an entirely new standard model out of the existing Japanese makes.

Ikegai builds two models, a four and a six, designated as 4 HSD 10 and 6 HSD 10 respectively. The cylinders dimensions in both models are 100 mm (bore) and 140 mm (stroke), making their piston displacements 4398 cc and 6597 cc respectively. They develop 50 h.p. and 70 h. p. at 2000 r.p.m., at a compression ratio of 117. Both models operate on the turbulence chamber principle and use domestic injection equipment.

The Ikegai Iron Works is one of the largest engineering concerns in Japan, controlling four subsidiaries. The Ikegai Automobile Co. is the central enterprise, around which are

grouped the Nippon Plate Engineering Company, the Ikegai Iron Works, the Manchuria Machinery Co. and Ikegai Casting Co. There are three loosely affiliated firms, the Nippon Forging Industry, the Tokyo Forging Industry and the Nippon Piston Ring Co.



Acme Photo

MIDGET MIDGET

Ralph Pickard of Hawthorne, Cal., is shown with the small model car he designed and built. The car weighs 7 lb. and is powered by a one-cylinder motor of one-fifth hp., giving it a speed of 45 m.p.h., it is said. Its two-ounce gas tank holds fuel sufficient for a run of about two miles. It has a 14-in. wheelbase and a two-to-one rear end ratio. The wheels are wood, covered with tires taken from the familiar cigarette ash trays. The car is made mostly of pressed steel with tubular steel for axles.

... slants

FARM CARS—Of all passenger cars in use throughout the United States, approximately 4,500,000 are owned by farmers, according to an estimate made public by J. R. Crossley, vice president of the Automobile Club of New York. "On the average," he stated, "farm families buy almost twice as many used cars as new cars. Usually they are of comparatively high value, but even so their cost averages only a little over one-third of the cost of the new cars purchased."

FARM TRUCKS—A study of truck costs for 1,384 farmers owning some fifteen different sized trucks, showed that about half the number own one and one-half ton models. Truck mileage costs with rated capacities were revealed as follows: One-half ton—5 cents per mile; One and one-half ton—6½ cents per mile; Seven and one-half ton—21½ cents per mile.

FLEETS—Largest fleet operators, according to The National Motor

Estimated Dealer Stocks of New Passenger Cars

	January	February	March	April	May	June
1937						
Production—U. S. Domestic Market†	285,749	276,469	376,245	410,592	400,415	387,121
Retail Sales—U. S.†	249,715	216,770	409,205	387,887	407,610	365,160
Change in Inventory	+36,034	+59,699	-32,960	+22,705	-7,195	+21,961
Inventory, first of month	248,200	284,234	343,933	310,973	333,678	326,483
1937 (continued)	July	August	September	October	November	December
Production—U. S. Domestic Market	341,189	299,496	110,122	273,753	269,580	212,655
Retail Sales—U. S.	347,120	310,312	192,967	212,651	212,389	171,643
Change in Inventory	-5,931	-10,816	-82,845	+61,102	+57,191	+41,012
Inventory, first of month	348,444	342,513	331,697	248,652	309,954	367,145
1938	January	February	March	April	May	June
Production—U. S. Domestic Market	130,273	119,896	153,316	160,028	140,239	123,333
Retail Sales—U. S.	126,442	120,348	188,325	193,392	187,306	155,811
Change in Inventory	+3,831	-452	-35,009	-33,364	-47,067	-32,478
Inventory, first of month	408,157	411,988	411,536	376,527	343,163	296,096
1938 (continued)	July	August	September	October	November	December
Production—U. S. Domestic Market	96,975					
Retail Sales—U. S.	153,426					
Change in Inventory	-56,451					
Inventory, first of month	263,618	207,167				

†—U. S. Census Bureau.

‡—Automobile Manufacturers Association.

Truck Show, Inc., are the Federal, state, county and municipal governments with 1,546 bodies using 222,780 motor trucks. First ranking among large fleet operators in private industry goes to the oil and gasoline companies with 85,558 trucks in operation. In the smaller fleet category, the express, moving and hauling business rate of outstanding importance with 156,945 motor trucks being operated by 5,522 concerns.

Ford Files Exceptions to NLRB Report

The Ford Motor Co. has filed 213 exceptions to the report of Trial Examiner Thomas H. Kennedy who recommended the company be ordered to reinstate 129 strikers at its Richmond, Cal., plant upon the basis of findings that the firm allegedly had discriminated against the CIO's United Automobile Workers' Union. Counsel for the Ford Co. asked the Board to overrule the examiner's recommendation, charging that the National Labor Relations Board hearing in the case was not "full and fair" and that the Trial Examiner possessed a "fixed bias and entertained a fixed prejudice against employers in general and in favor of unions."

Counsel for the Ford Co. said that the Board has no power to order re-employment of persons who voluntarily quit their jobs without suffering discrimination. Such an order was "unjust and unreasonable interference" with the company's right to hire and fire.

The examiner's findings that the company was engaged in unfair labor practices, counsel contended, were not supported by the evidence produced at the hearings.

Memorial Wind Tunnel

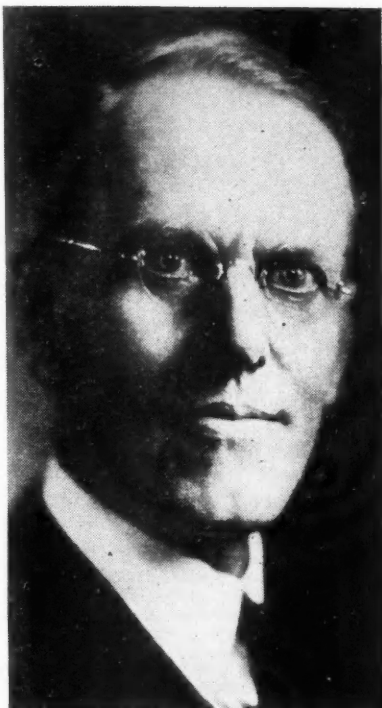
Ceremonies were held Monday, at the Massachusetts Institute of Technology, to dedicate a wind tunnel, capable of simulating flying conditions from sea level to stratosphere altitudes up to 37,000 ft., as a memorial to Orville and Wilbur Wright and their accomplishments in the field of aviation. The wind current is generated by a 2000 hp. engine with a thirteen-foot six-bladed propeller which, it is said, can generate a wind velocity of 400 m.p.h.

The ceremonies were one of the features of the opening day's program of the fifth international congress for applied mechanics.

Graham-Paige Finances

Working Capital of \$1,188,000 Result of Refinancing

Completion of negotiations which resulted in an improvement of the working capital position of Graham-Paige Motors Corp. by approximately \$2,300,000 have been announced by Joseph B. Graham, president.



J. B. GRAHAM, PRESIDENT,
GRAHAM PAIGE MOTORS CORPORATION

... who announced completion of the re-financing program. Said Mr. Graham, "With the new financing, the company will immediately launch an aggressive campaign for its share of the 1939 automobile business. ... we are in an excellent position for moving vigorously ahead."

The new financing converts a working capital deficit of \$1,112,000 as at July 31, 1938, to a net working capital of \$1,188,000 and gives the company a three to one ratio of current assets totaling \$1,784,000 over current liabilities totaling \$596,000, according to a pro forma balance sheet giving effect to today's arrangement.

This provides for \$750,000 of new money made available immediately from a five-year loan, voluntary extension of outstanding claims approximating \$1,396,000 for a five-year period with payments to be made thereon out of future increases in working capital, and extension of \$154,000 in notes payable and accrued interest on a comparable basis.

In addition, a personal loan of \$560,000 to the company was sub-

ordinated by Joseph B. Graham to the extended claims until such claims and obligations are paid in full.

"Operating expenses have been drastically reduced," said Mr. Graham. "Production of the Graham-Bradley tractor has served to absorb manufacturing burden to an extent that our 1939 automobile line, now almost ready for public announcement, will be able to carry highly competitive prices."

Anticipated tractor business for the coming year is in excess of 5000 units, according to Robert C. Graham, executive vice-president. This will include the two-plow size now being marketed through Sears, Roebuck & Company, and by Graham dealers in areas where Sears has no retail outlets, and a new one-plow, low-priced unit which will be ready for Spring selling and which, it is said, will be the first tractor in its price class to permit two-row cultivation.

Plymouth Reduces Prices on 1939 Models

The first price announcement of the industry for 1939 model cars was made by the Chrysler Corp. in stating that price reductions as large as \$15 have been made on some body styles of the 1939 Plymouth.

Prices on the 1939 Plymouth have been announced as follows: Plymouth "Roadking": Coupe—\$645; Two-door sedan—\$685; Two-door touring sedan—\$699; Four-door sedan—\$726; Four-door touring sedan—\$740.

Plymouth Deluxe: Coupe—\$725 (with rumble seat—\$755); Two-door sedan—\$761; Two-door touring—\$775; Four-door sedan—\$791; Four-door touring—\$805. The foregoing are prices "delivered in Detroit."

Harry Sparks

William Harry Sparks, plant superintendent of the Reo Motor Car Co. at Lansing, Mich., was killed Sept. 9 in an automobile accident at Hastings, Mich. He had been associated with Reo for 19 years.

Studebaker Sales

Sales of Studebaker passenger cars and trucks in August totaled 2,458, according to Paul G. Hoffman, president of The Studebaker Corp. This compares with 2,772 in August, 1937. This brings sales for the year to date to 26,392, compared with 63,797 for the first eight months of 1937.

Ourselves and Government

A weekly check list of legislative, executive and judicial actions affecting the automotive industries. First appeared in June 25 issue, p. 831.

Corrected to Sept. 15

CONGRESS

Adjourned June 16, sine die. All members of House and 36 Senators retire or face election in Autumn.

Legislative Legacies

MONOPOLY INVESTIGATION. The 12-member National Economic Committee is scheduled to issue subpoenas to business firms soon for production records, books, correspondence and additional information desired by the six Government departments participating in the inquiry. Steel, oil and insurance companies may be named in the first subpoenas. Because it was impossible for all of its members to be present in Washington, the first meeting of the full national economic committee which had been scheduled for this week has been postponed. No date has been set for the meeting but it is expected to be held at an early date. Present indications are that hearings will start about mid-October and that the insurance inquiry will be the first taken up.

WAGES & HOURS. Administrator Andrews has named a 21-member committee headed by Donald Nelson, vice-president of Sears, Roebuck & Co., Chicago, whose job will be to recommend minimum wages in the textile industry. This is the first industry committee to be named. Calvert Magruder, of Harvard Law School, and former general counsel of the NLRB, has been named general counsel.

AIRLINES. The Civil Aeronautics Authority has launched its national airport survey to determine both the civil and defense requirements of the country. The survey, under the direction of Richard G. Gazley, chief of the Authority's planning and developing division, will seek to determine, as required by the new law, if Federal participation in airport development is desirable.

The Civil Aeronautics Authority has passed a resolution, giving official support to National Air Travel Week (Oct. 1 to 9) commemorating the first 10 years of air passenger transportation.

DEPARTMENT OF JUSTICE

MONOPOLY. Status unchanged since report in AUTOMOTIVE INDUSTRIES issue of Aug. 13.

DEPARTMENT OF LABOR

CONTRACTS. Public Contracts Board reports government contracts for the week ended Sept. 8 totaled \$36,131.26 for transportation equipment and \$240,074.50 for "other machinery." Among the individual contracts was one for \$17,839.66 with the Allis-Chalmers Mfg. Co., of Milwaukee for tractors to be supplied the Interior Department; another was a \$10,206.56 contract with the Kellett Autogiro Corp., Philadelphia, for indicator assemblies for the Army Air Corps; and a \$25,924 contract with the Yellow Truck & Coach Mfg. Co., General Motors Truck & Coach Division, Pontiac, which covered trucks for the Marine Corp. Another contract awarded the same company and amounting to \$37,500 called for the installation of truck frames for the WPA.

STEEL LABOR. Public Contracts Board expected to submit recommendations shortly to the Secretary of Labor. If approved, the proposed minimum wage rates, based on prevailing minima in the industry, will become the standards below which industry members will not be permitted to pay their employees if they remain eligible for government business. Public hearings held July 25-26; Deadline date for filing briefs was Aug. 22.

AIRCRAFT LABOR. Members of the

aircraft manufacturing industry were given until Sept. 30 to file additional briefs after representatives of the industry protested at a two-day public hearing (Sept. 8-9) against the recommended minimum wage of 60c. an hour for most employees, 40c. for learners. Points remaining in controversy include, in addition to the learner and apprentice problem, the question of geographical differentials and of possible wage differentials between units of the industry. The Board tentatively has decided to exclude radio equipment and parachute manufacturers from coverage.

INTERSTATE COMMERCE COMMISSION

EFFECTIVE Oct. 1, the ICC has prescribed a maximum driving day of 10 hours to be followed by an 8-hour off-duty or rest period, or a weekly limitation of 60 hours on duty, for truck and bus drivers of common and contract motor carriers. The Public Health Service has been directed to conduct studies covering the fatigue problem, and the ICC Motor Carriers Bureau will make further studies of accident reports "for the light they may throw on the effects of safety of operation of different periods of duty."

FEDERAL TRADE COMMISSION

INVESTIGATION under the Withrow-Minton Resolution (M. J. Res. 351), Status remains unchanged since report in AUTOMOTIVE INDUSTRIES issue of Aug. 13.

F.O.B. PRICES case vs. G.M. and Ford, in which the FTC alleged that price advertising was misleading because of failure to include standard equipment, expected to be called up for hearing soon.

SIX PER CENT CASE. FTC cited Ford and General Motors in July, 1937, complaining of false and misleading representations in advertising prices of automobiles. Complaint alleges advertising six per cent charge on deferred payments by retail purchasers is misrepresentation because no provision is made for amortization. Case has been in the hands of the trial examiner for several weeks. The FTC brief expected to be ready soon.

FAIR TRADE PRACTICE rules for retail automobile dealers, introduced at public hearings during last NADA meeting in Detroit (see A.I., April 30, 1938), are still under study by the F.T.C. fair trade practice division headed by George McCorkle.

NATIONAL LABOR RELATIONS BOARD

In the Douglas Aircraft Co. (Santa Monica, Calif.) case, the Board is expected to hand down a decision shortly involving the sit-down strike. The case has been pending for a year and a half.

NLRB vs. Ford Motor Co. For latest development see news story on page 335 of this issue.

WAR DEPARTMENT

The War Department announced contracts totaling \$7,281,455 for anti-aircraft and other equipment as follows:

York Safe & Lock Co., York, Pa., mounts for anti-aircraft guns, \$1,557,330; Eclipse Machine Co., Elmira, N. Y., mechanical time fuses, \$1,027,000; Keuffel & Esser, Hoboken, N. J., height finders, \$1,108,800; Bausch & Lomb, Rochester, N. Y., height finders, \$239,400, instruments, observation, \$298,705.48; Sperry Co., Brooklyn, N. Y., directors, \$1,892,800; Read Machinery Co., York, Pa., mixers, smokeless powder, \$58,890, macerating machines \$34,420; F. J. Stokes Machine Co., Philadelphia, presses

pelleting, \$25,690; Shartle Bros. Machine Co., Middletown, Ohio, Jordan engines, \$107,670; McKiernan, Terry Corp., New York City, cutting machines, types A and B, \$64,500; Baldwin Southworth Co., East Eddystone, Pa., smokeless powder presses, dehydrating, type A, \$208,800; A. B. Farquhar Co., York, Pa., smokeless powder presses, vertical finishing, \$203,568, smokeless powder presses, blocking, \$140,800; smokeless powder presses, macaroni and finishing, type B, \$161,216; Watson, Stillman Co., Roselle, N. J., smokeless powder presses, macaroni and finishing, type A, \$79,200.

In addition to the awards placed with civilian manufacturers, the Ordnance Department has assigned to the various arsenals requisitions for the manufacture of a considerable number of anti-aircraft guns and related equipment.



CONDITIONER The Greyhound Lines, working in cooperation with engineers of the Waukesha Motor Co. and Tropic-Aire, Inc., have adopted an air conditioning system for year-round comfort in highway transport service. This view of the first Greyhound cruiser so equipped shows the ice engine, being withdrawn for inspection, and the reserve tank of water to maintain the evaporative condenser level.

Briggs Plant Closed (Continued from page 333)

of the men. The disturbance originally affected 150 men in the gun welding department after the steward had been discharged for attempting to get the men to slow down their operations. Company officials declared there had been no increase in the amount of work asked of the men over last year and no cuts in rates.

A night conference between company and union representatives was adjourned at a late hour and was to be resumed on Sept. 15.

Hudson Workers Recalled

The vanguard of the Hudson Motor Car Company's 12,000 employees

responded to work calls during the current week as the company got under way in the production of its 1939 models. With the addition of those receiving notices to report this week, the payroll is increased to over 5000. Other employees will be recalled as rapidly as factory operations permit.

Three new Hudson cars starting in the lowest priced field will soon be announced for the 1939 selling season. Strong emphasis is placed by the company on major chassis and body developments in safety and advancements in riding comfort.

C. A. Myers

C. A. Myers, 60, former director of engineering and member of the board of directors of the Firestone Tire & Rubber Co., and more recently president of the East Akron Supply Co., died Sept. 13 at his residence in Akron, Ohio. He served as a Firestone director for seven years and had charge of building the Firestone branch factories in California, Canada, and Liberia, W. Africa.

Rubber Industry May End Year In Good Position

All branches of the rubber and tire industry suffered drastic curtailment from 1937 levels during the first half of 1938, although they have accelerated substantially since July 1 with prospects of a fiscal year equally as good as last, according to official figures just compiled by the Rubber Manufacturers Association. Net sales value of manufactured rubber products shipments for the first half of 1938 were \$286,230,000 against \$444,230 in the same period of 1937 and \$346,560,000 in 1936. Net sales value of tires, tubes and tire sundries declined from \$266,645,000 in the first half of 1937 to \$177,250,000 this year.

Much of the drop in rubber goods sales was due to retrenchment of automobile manufacturing, affecting consumption of original equipment tires and many rubber parts made for all types of cars.

While first half year figures do not compare favorably with 1937, second quarter figures this year for all departments of the rubber industry was considerably better than first quarter results. Tire and tube net manufactured sales jumped from \$75,455,000 in the first quarter to \$101,790,000 in the second quarter while the grand total for all rubber products increased from \$129,000,000 to \$187,200,000.

Decision of the International Rub-

ber Regulations Committee in London, Sept. 12, to continue during the fourth quarter of 1938, the present 45 per cent restriction of crude rubber exports has stiffened crude rubber prices and brought encouragement to Akron and other rubber and tire manufacturers who see the action as a definite guard against any sharp sag in prices. The immediate effect of the announcement was to increase crude rubber prices on the New York market. It is estimated that continuation of the 45 per cent quota will reduce world stocks by at least 100,000 tons, relieving a surplus position which Sept. 1 showed more than 275,000 tons or a seven months' supply on the basis of consumption in the United States alone.

Libby-Owens-Ford

Libby-Owens-Ford Glass Co. has announced a boost in the schedule of its Ottawa, Ill., plant to 77 per cent. The Toledo laminated plant is now operating at 50 per cent of capacity, it is reported.

Retail Car Financing

The Department of Commerce has reported that the dollar volume of retail auto financing for July amounted to \$82,633,277, a decrease of 11 per cent from June and a drop of 52.6 per cent from July last year.

Wholesale auto financing during July was reported at \$61,279,684, a decrease of 17.4 per cent from June and a drop of 64.4 per cent from July, 1937.

Commercial Exhibits at N. Y. Show

Exhibitors of commercial vehicles at the National Automobile Show in New York City, as of this week, have been announced as being the American Bantam Car Co., Chevrolet Motor division of General Motors Corp., Dodge Brothers Corp., Federal Motor Truck Co., Hudson Motor Car Co., Mack Trucks, Inc., Plymouth Motor Corp., Studebaker Corp., and Willys-Overland Motors, Inc.

Advertising News Notes

Bert Jay North, formerly director of sales promotion and publicity for Studebaker Sales Co. in New Jersey, has joined Koretz, Kopel, Ideas, Inc., Newark advertising agency.

Eugene M. Zuber, famous among advertising men for his outdoor advertising of General Motors products, has left Campbell-Ewald Co. to become western manager of the General Outdoor Advertising Bureau, Chicago.

Forty radio announcers sojourned to Philadelphia to sit at the feet of Les Quailley, N. W. Ayer & Son, to polish off their technique in a distinctive style for announcing 168 inter-collegiate football games this fall for Atlantic Refining Co. Standardization is the goal of the scoreboard watchers so that all hearers will be able to identify at once the Atlantic yard-by-yard announcers. The games will go over 71 stations, and twelve will be at night.

Several Canadian national advertisers tied up with the new world's record set by Capt. G. E. T. Eyston. Dunlop Tire & Rubber Goods Co., Ltd., announced the use of Dunlop tires in large space in selected metropolitan dailies. C. C. Wakefield Co., Ltd., seized the opportunity to proclaim the fact that Castrol motor oil had been chosen for the event.

Professor Hugh E. Agnew, New York University, has written a book titled "Outdoor Advertising," published by McGraw Hill Co. The book shows the extent, methods and costs of the billboard industry, evaluates outdoor advertising in relation to other media and discusses how the advertising is sold and prepared.

The Northill Co., Inc., has arranged a series of demonstration meetings in the Middle West and East in commencing an active distribution program for its Civic Diesel Power Packs.

The Wilkening Manufacturing Co., maker of Pedrick Piston Rings, is using space in the Saturday Evening Post, Colliers and

the Country Gentleman during October and November in an effort to boost fall auto repair business through an offer of 25,000 free sets of Pedrick rings.

Erwin, Wasey & Co. has the Goodyear Tire and Rubber Co. (Great Britain) account in the introduction of the Goodyear Lifeguard.

Graham-Paige Motors Corp. has announced that advertising for the 1939 model will be concentrated in newspapers as soon as dealers are stocked—some time after Oct. 1. A trade paper campaign will be undertaken to enlarge the dealer body.

It is reported that radio will play a negligible part in the 1939 campaigns of the automobile industry. With the exception of Ford, it is regarded as doubtful that any other large manufacturer will have a network program. Spot and transcription may be used, although Chevrolet has withdrawn from the latter.

Detroit agencies have reported that radio is not a profitable medium for the sale of cars. In connection with Buick, which jumped from seventh to fourth place, it was pointed out that air advertising was confined to occasional flight broadcasts.

Arthur Kudner agency has announced that Buick will be the first of the G.M. automotive divisions to go back on the air. It will use 26 wax recordings, each a 12-word announcement.

Beverly Baxter will resume his weekly trans-Atlantic broadcasts of news and events of interest to Canadians, on Oct. 7, again under the sponsorship of General Motors of Canada. A network of 34 Canadian Broadcasting Corp. stations will carry the program to be heard Fridays at 10 P. M. MacLaren Advertising Co., Ltd., is the agency.

Occasional insertions in Canadian newspapers, farm publications and motor magazines are carrying a new campaign for U.S.L. Battery, Ltd. R. C. Smith & Son is the agency.



Written by the Guaranty Trust Co., New York

The upward trend in business activity continued last week, and the outlook for the coming months is believed in many quarters to be decidedly favorable. Considerable reliance is being placed on the belief that automotive activity in the next few months will have a strong stimulating influence on general business activity. The weekly index compiled by the *Journal of Commerce* for the week ended September 3 showed the eighth consecutive advance, rising to 82.0, as compared with 80.5 for the week before and 102.1 for the corresponding period last year. Car loadings, electric output, steel operations, and automotive activity reached high records for the current year; and bituminous coal production was the heaviest since last spring. A moderate decline developed in petroleum runs-to-stills.

Railway freight loadings during the week ended September 3 totaled 648,039 cars, which marks an increase of 27,528 cars above those in the preceding week, a decline of 153,500 cars below those a year ago, and a drop of 117,092 cars below those two years ago.

Production of electricity by the electric light and power industry in the United States during the week ended September 3 was 7.4 per cent below that in the corresponding

period last year. Output during the preceding week showed a decline of 7.0 per cent below that a year ago.

Production of lumber during the week ended August 27 stood at 70 per cent of the 1929 weekly average. Production and shipments were at about the same levels as in the preceding week, which for production was the highest for the year to date. New orders continued their slight downward trend and were the lowest since mid-June.

The dollar value of store chain sales during August trade made the best comparison with that in a corresponding month last year thus far in 1938, with the exception of April, when the Easter sales volume was recorded.

Average daily crude oil production for the week ended September 3 amounted to 3,349,100 barrels, as compared with 3,388,500 barrels for the week before and 3,692,500 barrels for a year ago.

Professor Fisher's index of wholesale commodity prices for the week ended September 10 stood at 80.6, as compared with 80.6 the week before and 80.4 two weeks before.

The consolidated statement of the Federal Reserve banks for the week ended September 7 showed no changes in holdings of discounted bills, bills bought in the open market, and Government securities. Money in circulation increased \$76,000,000, and the monetary gold stock rose \$102,000,000.

Standard Glass Requirements For Twenty-four States

The current issue of *Industrial Standardization* reports that twenty-four states and the District of Columbia have adopted the American Standard Safety Code for Safety Glass. This was revealed in a survey made by the American Standards Association.

Of the other states, three have their own specifications to which safety glass must comply; one provides in general terms that the glass must be manufactured in order substantially to prevent shattering, one expects to adopt the Interstate Commerce Commission regulations, two accept reports of tests made accord-

ing to National Bureau of Standards' requirements, three provide that the glass must be approved by specified state departments, and two have no requirements to which safety glass must comply. Eleven states, the survey showed, have no regulations requiring that safety glass be used in motor vehicles.

Aviation Manufacturing Corporation Takes Over Stinson

W. H. Beal, president of the Aviation Manufacturing Corp., has announced that the property of the Stinson Aircraft Corp. has been acquired and that manufacture of Stinson planes will be continued by the Stinson Aircraft division of

Aviation Manufacturing Corp., at Wayne, Mich., with the same personnel. The change in organization, which involved liquidation and dissolution of the subsidiary corporation, was made primarily for corporate purposes, it was stated.

O. R. Stocke, for nine years associated with Stinson, has been elected a vice-president of Aviation Manufacturing and will remain in charge of the manufacture of Stinson planes, it was reported. W. A. Mara, also with Stinson, has been elected vice-president in charge of sales.

Labor

CIO-UAW Board Impasse May be Broken Soon

Negotiations between representatives of the CIO and the international executive board of the United Automobile Workers Union over the John L. Lewis peace proposal for ending the internal UAW quarrel were still at stalemate during the forepart of the current week after discussions between the two groups had been held regularly for six full days.

There were increasing signs, however, that the impasse would be broken before the week ended, although it still remained to be seen whether Homer A. Martin, UAW president, would be successful in his resistance to the CIO plan or whether the expert Lewis negotiators would be able to wean away enough of the Martin support to come out ahead.

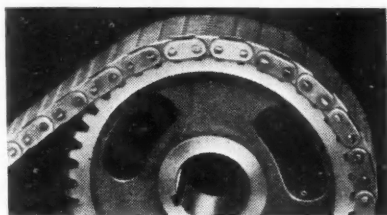
Should Martin hold out successfully it is likely that the supporters of the peace plan, as well as the out-and-out anti-Martin faction within the UAW, would ask the CIO to endorse a special convention at which a rival union would be established, which in turn could only result in a bitter fight for recognition and could precipitate much bickering of the status of current agreements between manufacturers and the original UAW.

Martin has daily announced that he would not accept the peace proposal and was reported to be maintaining a supporting majority on the "purged" executive board, although conflicting reports indicated that some of his support was wavering. Many of the larger UAW locals have already voted in support of the CIO proposal, although in several instances Martin has succeeded in getting another vote favoring his stand, while in one instance a meet-

ing called for this purpose was canceled through efforts of the CIO negotiators through fear of disorders.

The peace proposal under negotiation called for reinstatement of five expelled officers and board members and submission of future disputes to the CIO. Phillip Murray and Sidney Hillman, CIO vice-presidents, have been representing Lewis with the Martin faction resisting on the grounds that the expulsions must stick and that the proposal, if granted, would forfeit the UAW's autonomy.

Michigan Tool Co., Detroit, returned to a five-day week following settlement of a strike with the Mechanics Educational Society of America which had been in effect since July 27. The company, which produces gear cutting and checking equipment, metal cutting tools and worm gearing, had been on a four-day basis prior to the strike.



MORSE CHAIN A new timing chain which embodies some special features of design has been introduced by the Morse Chain Co. and will be used on several standard make cars. It provides for increased resistance to vibration or whip by means of special shaped joint pins of oblong section. Thus a flat surface is obtained on the pin which serves as a support for the links of the solid section and offers a better means for reacting shock loading of the chain. The floating link section supports a semi-circular hardened steel bushing at each end which engages firmly with the joint pins. All links are full butting, and the chain is of the side guide type.

The Morse Chain Company have also developed a new heat treated cast iron camshaft sprocket, which provides hardness increased more than one hundred percent above standard iron sprockets, and which is said to withstand higher engine speeds for long duration, or extreme shock loading without evidence of wear on the sprocket teeth.

General Motors August Car Sales

August sales of General Motors cars to dealers in the United States and Canada, together with shipments overseas, totaled 55,431, compared with 188,010 in August a year ago, according to figures released by the General Motors Corp. Sales in July were 90,030. Sales for the first eight months of 1938 totaled 759,414, compared with 1,512,061 for the same eight months of 1937.

Sales of General Motors cars to consumers in the United States totaled 64,925 in August, compared

with 156,322 in August a year ago. Sales in July were 78,758. Sales for the first eight months of 1938 totaled 641,803, compared with 1,191,366 for the same eight months of 1937.

Sales of General Motors cars to dealers in the United States totaled 34,752 in August, compared with 157,000 in August a year ago. Sales in July were 61,826. Sales for the first eight months of 1938 totaled 516,226, compared with 1,224,057 for the same eight months of 1937.

Automotive Metal Markets

Moderate Step-up in Steel Operating Schedules Result of Orders from Car Manufacturers

While there is talk of business in the heavier steel products being retarded as the result of delay in the issuing of fourth-quarter prices, no such condition is noted in buying by automobile manufacturers and parts makers. Orders from automotive consumers for sheets, strip steel, carbon and alloy steel bars, etc., continue to make it possible for many of the mills to step up their operating schedules moderately. All of this business is for nearby delivery. None of it entails spectacular tonnages and none of it represents covering of future needs to take advantage of prevailing prices, which by many buyers are looked upon as attractive. Moreover, virtually all automobile manufacturers are represented among the buyers. It is generally supposed that the reason why steel prices for fourth quarter delivery have not yet been announced, is that the steel producers are waiting for a decision by the Public Contracts Board on minimum wages, which must be paid by Government suppliers with contracts in excess of \$10,000. It is not thought that Secretary Perkins' determination of the minimum wage rate will have any effect on prices of the kinds of steel used in automotive manufacture. Ingot capacity in operation this week is reported by the American Iron & Steel Institute at 45.3 per cent, compared with 44 per cent in the last holidayless week. Distribution of orders among the different steel producing districts is rather uneven, as is frequently the case, but there are some who interpret this as indicating a belated shift resulting from the recent change in the basing point set-up. Only future developments will show whether there is anything to this or not. The leading steel producer's record of shipments in August shows an increase

Cuban Imports

Imports of passenger automobiles into Cuba during July, 1938 numbered 51 units compared with 53 units during the preceding month and 219 units in July, 1937, according to a report to the Department of Commerce from the office of the American Commercial Attache at Habana.

Imports of trucks numbered 55 units as compared with 44 units in the preceding month and 200 during July, 1937, the report stated.

of 26.6 per cent over those of July. Shipments into automotive consumption held their own.

Mild betterment in pig iron sales to automotive foundries is reported. Some of the pig iron sellers are reported to have booked fourth quarter business at unchanged prices, thus confirming the general belief that there will be no change in steel prices, the pig iron market in recent years having taken its price cue from the steel producers.

Non-ferrous metals marked time pending developments in Europe. Czechoslovakia has imported heavily increased tonnages of copper from the United States during the past nine months, and is believed to be still adding to its reserve. Germany and Japan are also thought to be taking on additional tonnages to swell already heavy reserves of copper. Domestic consumers are buying copper in routine way. Price of spot electrolytic remains at 10 $\frac{1}{8}$ cents.

Tin was not only under the influence of the political tension in Europe, but also affected by another sharp decline in Sterling exchange here. Spot Straits tin was quoted at 42 $\frac{3}{4}$ cents the beginning of the week and on Tuesday the asking price was 42 $\frac{7}{8}$ cents. The U. S. Navy Department bought 100 tons of Grade A tin at 42.188 cents, delivered Brooklyn.

Formation of a cartel of the principal lead producers outside of the United States, while having no direct influence on the American market, which excludes foreign lead through a 2 $\frac{1}{8}$ cents per pound duty, will work toward curtailment of world production, and this invariably exerts a bullish influence even in self-contained countries, such as the United States. The market here remains unchanged for the present. —W. C. H.



MILL Slab entering vertical and horizontal descenders located ahead of first roughing stand in the continuous strip mill just completed by the Inland Steel Co. Rated capacity of this new mill is 45,000 tons per month. It increases the company's sheet and strip capacity by about one-third.

The new mill is the finishing touch to the building of a new flat rolled steel plant which Inland began in 1932 with the construction of a 76-in. continuous strip mill.

appointed supervisor of Plymouth field activity, succeeding **H. J. COOK** who has been transferred to the staff of **A. Vanderzee**, vice-president of Chrysler.

W. R. MORSE, formerly special representative in Los Angeles, replaces Mr. Somerville in Detroit. To succeed Mr. Morse, **BRUCE K. STEELE** has been appointed.

In the Boston territory, **W. H. SAUERBECK**, formerly of Chrysler service division, has been appointed Plymouth special representative, succeeding **G. RAY SMITH** who recently resigned.

A. MUNCHWEILER rejoins Plymouth as special representative in the Buffalo territory, succeeding **J. R. LARKIN** at present assigned to the home office sales promotion staff. **J. E. O'BRIEN** has been appointed special representative in the St. Louis territory, succeeding **M. V. Dunavant**, resigned.

J. E. BAYNE has been made director of sales, Chrysler division of Chrysler Corp. He was formerly head of the factory branch of the Chrysler Detroit Co.

GARDNER W. CARR, president of Menasco Mfg. Co. has assumed direction of production for his company, following the recently announced resignation of **A. S. MENASCO**.

F. L. Faurote, Publicist, Dies at Fifty-Seven

Fay Leone Faurote, for many years an authority on the history of the automotive industry, died September 5 in his home in Garden City, Long Island, N. Y. He was fifty-seven years old.

A member of the Society of Automotive Engineers for more than 27 years, Mr. Faurote entered the industry in 1903, upon his graduation from the University of Michigan. He joined the Olds Motor Works as assistant experimental engineer, and was soon appointed advertising manager by Olds, and later was advertising manager for the S. R. Thomas Motor Car Co., brilliantly dramatizing the "Thomas Flyer" and other models.

He served on the advertising staff of Curtiss Aeroplane & Motor Corp., and later entered the advertising agency field. In 1921 he established his own public relations firm at 420 Lexington Ave., New York.

From 1933 to 1936 he was chairman of the Institutional History and Museums committee; from 1935 to 1937 he was a member of the Grading committee of the SAE. For several years he was the Society's publicity manager, and for a number of years managed the Engineering Exhibit held each year in conjunction with the Annual Meeting of the Society.

He was the author of a biography of Glenn H. Curtiss and Henry Ford, and wrote "The How and Why of the Automobile," "Busy Mans Text Book on Automobiles," "A Boy's Text on the Gas Engine," and "My Philosophy of Industry."

He wrote many magazine articles on the automobile, the automotive industry, and leading personalities of the business. He also spent several years teaching engineering and advertising.



J. W. MERIAM, for the past 24 years vice-president and secretary of the Lincoln Electric Co., Cleveland, has retired.

R. B. BARNETT has resigned his position as assistant manager of sales for the Union Drawn Steel division of Republic Steel Corp. to become manager of the Buffalo office of Peter A. Frasse & Co., Inc.

RALPH J. REICH has been appointed manager of the Buffalo branch of the hoist and body division of Gar Wood Industries, Inc.

W. F. BUGENHAGEN has been appointed general sales manager of the Aluminum Goods Mfg. Co. to succeed the late **CARL F. ISSELMAN**.

WILLIAM T. MINOR has been appointed manager of the newly created Southeastern region of the Nash Motors division of Nash-Kelvinator Corp.

JOSEPH GESCHELIN, Detroit Technical Editor, AUTOMOTIVE INDUSTRIES, will address the Detroit Boosters Club at its first fall meeting, Sept. 26. Subject of the talk is to be a discussion of current trends in passenger car design.

R. K. JACK, veteran engine designer, has joined the engineering staff of the Reo Motor Car Co. He will take charge of the company's engine department.

KARL M. GREINER, since 1934 Buick zone service manager in Detroit, has been appointed retail service promotion manager of the Nash Motors division of Nash-Kelvinator Corp.

Shifts within the Plymouth field organization, resulting in new district assignments for several veterans of the staff, have been announced. **R. C. SOMERVILLE**, formerly special representative for Detroit, has been

Rubber Consumption Estimate

Consumption of crude rubber by manufacturers in the United States during the month of August, 1938, is estimated to be 38,170 long tons, which compares with 32,209 long tons during July, 1938. August consumption shows an increase of 18.5 per cent over July, but is 8 per cent under August a year ago, according to statistics released by the Rubber Manufacturers Association. Consumption for August, 1937, was 41,506 (revised) long tons.

This organization reports gross imports of crude rubber for August to be 31,099 long tons, an increase of 35.7 per cent over the July figure of 22,918 long tons but 36.3 per cent under the 48,785 long tons imported in August, 1937.

This Association estimates total domestic stocks of crude rubber on hand Aug. 31 at 277,463 long tons, which compares with July 31 stocks of 284,914 long tons and 174,195 long tons on hand Aug. 31, 1937.

Motor Bus Meeting

Motor bus executives from throughout the United States who direct the operation of city and intercity bus companies, large and small local and national transportation systems, will meet in Chicago Sept. 21-23 to discuss various problems of their industry.

Improved safety on the highways; bus fares; the handling of United States mail; the use of Diesel engines in metropolitan bus operation; reports of the first operation of air-conditioned buses and the promotion of inter-American travel will be discussed by the motor bus executives. Among the speakers

listed to appear before the convention is Dr. James S. Thomas, president of the Chrysler Engineering Corp.



Republic Alloy Steels is the title and subject of a 260-page book recently published by the Republic Steel Corp., Alloy Steel division, Massillon, Ohio.

Spray equipment is described and illustrated in a catalog published by the Eclipse Air Brush Co., Inc.*

A combination **sharpening machine** for reamers, hobs and milling cutters is described in a folder by the Barber-Colman Co.*

Wire strippers and cutters are the subject of a folder by the Ideal Commutator Dresser Co.*

Enamel storage is discussed in a booklet (Enameler's Reference No. 2) released by the Porcelain Enamel & Mfg. Co.*

Capacities, specifications and mechanical features of the largest **Caterpillar Diesel tractor** have been grouped together in a new booklet, Form 4876, just issued by the Caterpillar Tractor Co.*

Bulletin No. 9-38, by the Covel Manufacturing Co., describes in 16 pages **Yankee twist drill grinders** with new attachment for grinding regular twist drills 2, 3 or 4 lip, counterbores, dual and special drills.*

Joseph T. Ryerson & Son, Inc., has published a brochure concerning **Allegheny Stainless Steels**.*

A new catalog has been prepared by the Lauson Co. which describes its line of **marine engines**, including the new small inboard four-cycle engines described elsewhere in this issue.*

Of interest to exporters and manufacturers dealing with Canada is a study made by the Department of Commerce titled "Trading Under the Laws of Canada" and further identified as Trade Promotion Series No. 176. Copies may be had at 20 cents each upon application to the Supt. of Documents, Government Printing Office, Wash., D. C. or any branch of the Bureau of Foreign and Domestic Commerce.

A symposium on **protecting metals against corrosion** comprising four papers presented at the Detroit section meeting of the American Society for Testing Materials, is available from the society at 50 cents per copy. Address A.S.T.E. Headquarters, 260 S. Broad St., Philadelphia.

The second section of the 1938 Laws Bulletin has been published by the National Highway Users Conference, Wash., D. C. It is a digest of new legislation affecting highway users.

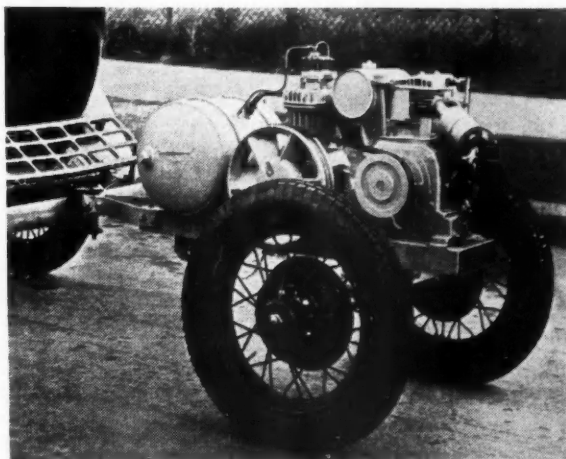
* Obtainable from editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia.

General Motors Stockholders

The total number of General Motors common and preferred stockholders for the third quarter of 1938 was 399,255 compared with 403,282 for the second quarter of

PORTABLE

The Binks Manufacturing Co. is offering portable painting outfits in a variety of mounting styles. Designed to attach to the bumper or frame of passenger car or truck, this mounting style is equipped with a sturdy trailer type hitch. The outfit is equipped expressly to facilitate painting in widely scattered locations.



1938 and with 363,675 for the third quarter of 1937, according to a report by the General Motors Corp.

There were 378,150 holders of common stock and the balance of 21,105 represents holders of preferred stock. These figures compare with 382,325 common stockholders and 20,957 preferred for the second quarter of 1938.

Passenger Total Up, Express Down, in Air Transport Report

American-operated air carriers flew 2,213,634 more miles and carried 113,511 more passengers during the first six months of 1938 than in the corresponding period of 1937, according to reports received by the Civil Aeronautics Authority from operators of domestic lines and extensions to foreign countries. The total amount of express carried, however, showed a decrease of 318,045 pounds. During this period the lines carried 666,825 passengers, 3,943,353 pounds of express, and flew a total of 38,734,654 miles. Passenger-miles flown totaled 289,554,564, an increase of 47,876,120 miles over the January-June, 1937, period.

The lines had 362 airplanes in operation at the end of June, 1938.

American Rolling Mill Loss

American Rolling Mill Co. and subsidiaries had consolidated net loss of \$537,191 for the twelve months ended July 31, Charles R. Hook, president, announced.

Since the company's fiscal year is the calendar year, no exact comparison is available. For the six months ended June 30, 1938, the company reported consolidated loss of \$723,164. In the September quarter of 1937 net income was \$2,646,525, and the December quarter net loss was \$1,057,961.

Greyhound Equipment

The Interstate Commerce Commission at Washington, D. C., received application on Sept. 10 from the Southeastern Greyhound Lines, Lexington, Ky., for permission to issue \$45,848 of equipment purchase notes. The company said it planned to use the funds to finance partially the purchase of three twenty-eight-passenger air-conditioned buses from A.C.F. Motors Company.

Heat Treatment Plant

Modern Heat Treating & Forging Co. will soon begin erection of a new plant in Buffalo, N. Y., it was announced by Frank Feind, president. The firm specializes in heat treatment of steel to temper and harden it so it can be passed through large molding presses. Its products go principally into the automobile industry.

New Australian Air Firm

Formation of the Commonwealth Aircraft Corp. at Melbourne, Australia, "definitely designed as a defense measure," is almost complete, Sir Lennon Raws, chairman of the Imperial Chemical Industries of Australia and New Zealand, said on arrival in Montreal last week. The aircraft corporation will manufacture airplanes and airplane engines. The cost of the plant will be in the neighborhood of \$3,000,000.

Kansas City Auto Show

Following considerable indecision as to whether or not Kansas City would hold an automobile show this year, The Kansas City Motor Car Dealers Association has announced the show will be held in the Kansas City Municipal Auditorium Nov. 26 to Dec. 3.

Automotive Men Win Prizes for Papers on Welding

In the automotive division of the \$200,000 award program of the James F. Lincoln Arc Welding Foundation a school bus body, a truck body and a track roller frame were the subjects of papers for which three design engineers received first, second and third awards. Announcement of the winners of the 382 awards was made on Friday, the list including many names of men in the automotive field.

H. C. Wendt, chief engineer, Hackney Bros. Body Co., Wilson, N. C., received first award in the automotive division of \$3,764.94 for his paper, "Welded School Bus Body." Second award of \$2,543.88 went to Fred S. Beach, Sr., designing engineer, Northwestern Electric Co., Portland, for his paper, "Welded Track Roller Frame." C. A. Davis, Jr., engineer, Caterpillar Tractor Co., East Peoria, received the third award of \$1,729.84.

SAE Meeting Program

The final revised program for the Society of Automotive Engineers' National Fuels and Lubricants Meeting, to be held in Tulsa, Okla., Oct. 6-7, has been announced as follows:

THURSDAY, OCTOBER 6

10.00 A. M. A. V. Bourque, Chairman
Tuning Motors on a Chassis Dynamometer—L. L. Fawcett, Auto Electric Co. Four Ball Testing Apparatus—Bataafsche Petroleum Maatschappij, Proefstation Delft.
2.00 P. M. Ralph R. Matthews, Chairman
Characteristics Relative to Ring Sticking and Engine Cleanliness of Mid-Continent Lubricating Oils—John V. Brazier, Barnsdall Refining Corp., and Sidney Born, University of Tulsa (Western Petroleum Refiners Association Paper).

Operation and Maintenance Problems of a Utility Fleet—Robert Collins, Kansas City Power and Light Co.

7.00 P. M. W. F. Lowe, Chairman
SAE, A Cooperative Community—C. B. Veal, research manager, SAE.

Oil Industry Automotive Maintenance Problems—G. L. Wheatley, Petroleum Motor Transportation Association.

FRIDAY, OCTOBER 7

10.00 A. M. T. J. Schuetz, Chairman
Developing Trucks and Trailers for Portable Well Drilling Work—John D. Gordon, Dart Truck Co.

Muticylinder Engine Adaptations in Oil Industry—H. W. Ladd, Stanolind Oil & Gas Co.

2.00 P. M. Earle W. Pughe, Chairman
Motor Vehicle Maintenance—R. G. Horridge, Southwestern Bell Telephone Co. Methods of Oil Temperature Control—F. M. Young and W. R. Ramsaur, Young Radiator Co.

7.00 P. M. Frank A. Suess, Chairman
Dinner

Debate: Resolved: That Rear Engine Mounting is More Desirable Than Forward Engine Mounting for Passenger Cars.

Affirmative: Student Representatives, Kansas State College, Department of Mechanical Engineering.

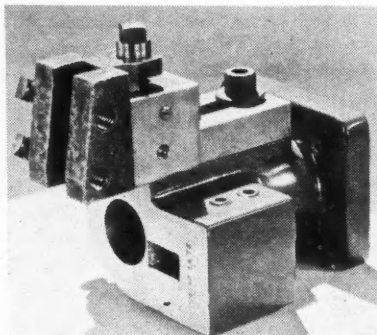
Negative: Student Representatives, College of Engineering, University of Oklahoma.



Forming Tool

Combination turning, boring, and facing tool developed by Gisholt

A new combination turning, boring and facing tool for combining these operations in one is offered by the Gisholt Machine Co., Madison, Wis. It is also possible through the use of forming tools to cut radii or any other desired shape while boring and facing or turning.



Gisholt turning, boring and facing tool

The tool permits a wide variety of operations to be carried on simultaneously. Exact diameter size is obtained through the use of micrometer graduated screw. Long or short turns may be taken on the diameter by adjusting the turning arm, which is mounted on an adjustable slide. Should it become necessary to turn a diameter larger than the capacity of the tool, a spacer block can be inserted under the adjustable turning arm, raising it to the desired height. Different size and shape cutters may be used in the tool by means of the large tool-holding slot and properly placed set screws. Drills, boring bars and facing bars can be carried on the center hole.

All cuts taken by the tool are in the exact desired relation to each other. Concentricity between bore and turn is positively maintained and with no variation between length of cuts, shoulders and faces.

This tool bolts to the turret face and is made for Gisholt Nos. 3, 4 and 5 ram type universal turret lathes as well as similar type turret lathes.

Thread Grinder

New Ex-Cell-O machine designed to facilitate production of long threads

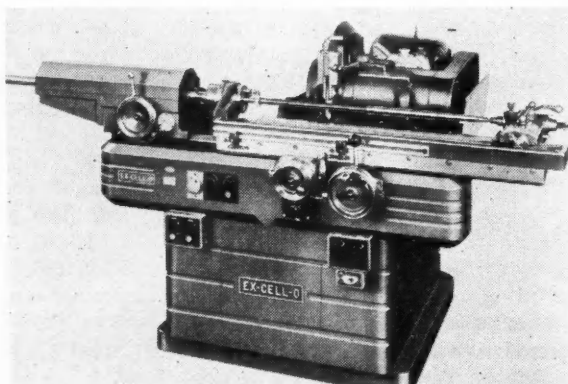
To facilitate the production grinding of long threads on such parts as aircraft landing gear strut tubes, machine tool feed and lead screws, Ex-Cell-O Corp., Detroit, has added a new and larger capacity thread grinder to its line.

Modeled after the new standard No. 31 production machine, the new equipment will grind threads up to 22 in. in length on work up to 36 in. long between centers. If straight threads are to be ground, the grinder will handle work up to 6 in. in diameter. With a taper attachment, work up to 5 in. in diameter may be ground.

The new grinder is designed to grind in both directions. Wheels can be dressed without slowing down the wheel, to insure accurate dressing under actual operating conditions.

Four two-step interchangeable pulleys for both wheel and motor spindles are furnished with the machine which make it possible to maintain the same surface grinding speed, within three per cent according to the manufacturer, as the grinding wheel wears down in service from the original 18-in. size down to a minimum of 12-in. diameter.

The machine may be set to stop or



Ex-Cell-O machine for grinding threads up to 22 in. in length

to reverse automatically at the end of each stroke. Independent controls are provided for starting and stopping both the wheel head and coolant pump motor; for selecting either fast or slow table movement in either or both directions, with either a right-hand or left-hand lead screw; for reversing the machine circuit for left or right-hand lead screws; and for starting and stopping the work table. An emergency stop-button shutting down the entire machine is also provided.

The machine is also available with back-off attachment.

Styled by Harold Van Doren Associates, Toledo industrial designers, a new light-weight scale for packing, checking, testing and weighing operations requiring predetermined weighing has been introduced by the Toledo Scale Co.

An air-motor operated agitator known as the Pneumix Type B, to handle batches of material up to 100 gal., has been developed by the Eclipse Air Brush Co., Newark, N. J. It is claimed that the stirring device is spark-proof and cannot heat.

40 Years Ago

—with the ancestors of
AUTOMOTIVE INDUSTRIES

Compressed Air Carriage

The only compressed air carriage ever built and operated in this country was constructed at the works of the American Wheelock Engine Co., Worcester, Mass., by the Pneumatic Carriage Co.

The carriage has seating accommodations for six passengers, weighs 2700 lb. and will run 20 miles over ordinary good roads on one charge. A grade of 20 per cent is claimed to be surmountable.

The wooden wheels are 30 and 42 in., respectively, and pneumatic tires of 4-in. diameter render riding as easy as possible.

The storage reservoirs have a capacity of 13 cu. ft. of compressed air at 2000 lb. pressure, and a factor of safety of $6\frac{1}{2}$ to 1, the bursting pressure being 13,000 lb. to the square inch. They are made of nickel steel and weigh 66 lb. to the cubic foot capacity.

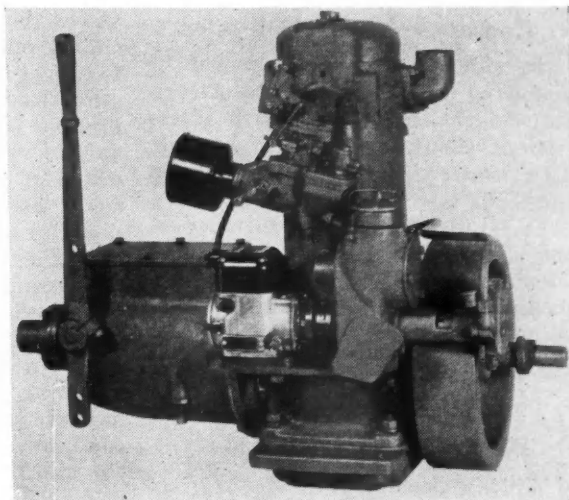
The motor, of the reciprocating type, weighs 400 lb. and operates at 350 revolutions when the carriage is making 15 m.p.h.

From *The Horseless Age*, September, 1898.

Automotive Industries

MARINE ENGINE

One of six sizes of small, inboard, four-cycle, marine engines announced by the Lauson Co., New Holstein, Wis., in both air and water-cooled types. Model shown is the water-cooled type designated as ZW927, it is rated at five to five and one-half hp. and may be furnished with clutch and gear reduction or with reverse gear.



Rim Inspections

Rims inspected and approved for August 1938 were approximately 65 per cent below the number for the same month last year, according to a report by the Tire and Rim Association. Total for August 1938 was 467,506 as compared with 1,342,945 for August 1937. Rims inspected and approved for the first eight months of 1938 numbered 4,940,417; number for the first eight months of 1937 was 15,958,223.

Twin Coach Shows Profit

The Twin Coach Co. report for six months ended June 30, 1938, indicated a net profit of \$60,636 after depreciation and federal income taxes. This compares with a net profit of \$428,928 shown for the first six months of 1937.

Books

—of automotive interest

DER INDICATOR, SEINE THEORY UND SEINE MECHANISCHEN, OPTISCHEN UND ELEKTRISCHEN AUSFUHRUNGSARTEN. (*The Indicator—Its Mechanical, Optical and Electrical Constructions*), by Prof. J. K. DeJuhasz, Pennsylvania State College, and Dr. Ing. J. Geiger, Augsburg. Published by Julius Springer, Berlin.

The engine indicator has not yet attained the degree of importance in the internal-combustion engine field that it possessed in the steam engine field for many decades, as an aid in experimental development and in setting valves in operation. This is largely due to the fact that the early type of mechanical indicator became

more or less impractical when engine speeds began to exceed 500 r.p.m. Difficulties also arose from the fact that if a change in the engine operating conditions by attachment of the indicator was to be avoided, the pressure-sensitive element had to be practically flush with the combustion chamber wall, where it would be subjected to very high temperatures.

Ever since the advent of the automotive or high-speed type of engine a great deal of development work has been done on indicators suitable for use in connection with it, and really remarkable success has been achieved in eliminating inertia effects. Optical and electrical indicators of various types have been developed in succession. The less satisfactory instruments gradually disappear from the market, their places are taken by more highly developed ones.

Messrs. DeJuhasz and Geiger in the work under review present not only a brief history of the engine indicator from the time of its introduction by Watt, and an analysis of the dynamics of indicator mechanism, but also brief illustrated descriptions of a very large number of indicators, these being grouped under the headings of Mechanical Indicators, Optical Indicators, Electrical Indicators, Point-by-Point Indicators and Indicators for Special Purposes. There are also chapters on Checking and Calibration of Indicators, Faulty Diagrams, Mechanical or Electrical Indicators, and the indicating of Piston Machines.

Both authors are specialists in the field of engine indicators and similar instruments. Professor DeJuhasz having developed a successful point-by-point indicator and Dr. Geiger a torsigraph, a turbulence gage, etc., and the work therefore may be regarded as authoritative. Typographically it is of high quality.

September 17, 1938

Roosevelt Names Delegates

President Roosevelt has named the following as members of the American delegation to the Fourth International Conference on Private Air Law which convenes in Brussels on Sept. 19:

G. Grant Mason, Jr., member of the Civil Aeronautics Authority; Stephen Latchford, of the State Department; and Denis Mulligan, who recently resigned as director of the old Bureau of Air Commerce.

Willys-Overland Report

Willys-Overland Motors, Inc., has reported a net loss of \$595,619 for the quarter ended June 30, 1938, which is the third quarter of its fiscal year. The company faces the new car season with a strong current position, according to David R. Wilson, president.

Engine Timing vs. Knocking

When a gasoline engine operates near the knocking limit and the spark is timed for maximum power, any slight advance of the spark during any cycle may cause knock during that cycle. Audible knock may appear as sharp "pings" at frequent intervals, depending on variations in the spark timing. In engines in which the spark timing is quite regular, any knock is noticeably more consistent, and its boundaries are more sharply defined, than in engines with irregular timing. An infrequent knock may not be particularly harmful in itself, but knock of any kind is apt to cause a gradual rise of the temperatures of critical surfaces in the combustion chamber, and may thereby cause surface ignition or lead to a continuous or more severe form of knock. For this reason knock should be avoided. If engine operation is limited to the non-knocking power range, the inlet pressure and the power output can be increased by improving the regularity of the spark timing.

Tests bearing on the effect of spark-timing regularity on the knock-limitations of engine performance were made for the N.A.C.A. on a high-speed single-cylinder engine and are reported upon by Arnold E. Biermann in N.A.C.A. Technical Note No. 651. The regularity of the spark timing was varied by driving the timer from different engine shafts, and a simple and reasonably accurate method of determining the spark timing was evolved.

The chart reproduced herewith

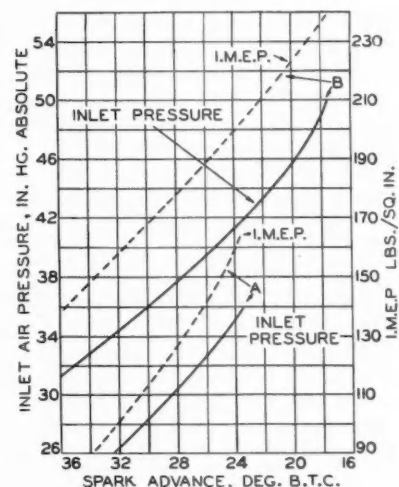
shows the effect of accurate ignition timing on the non-knocking limit of technical iso-octane +1 ml. of tetraethyl lead. Curves A indicate the highest allowable intake pressure and the resulting i.m.e.p. for the condition of incipient knock at various spark settings when the ignition timing lies within the limits of ± 5 crankshaft degrees. Curves B give the same information for the case in which the timing is within $\pm \frac{3}{4}$ crankshaft degree. The improvement in allowable boost pressure amounts to approximately 7 in. of mercury at a spark setting of 27 degs. advance. This is the timing for maximum power for these operating conditions. The corresponding change in i.m.e.p. was from 133 to 183 lb. per sq. in. Maximum engine power for constant inlet-air pressure was practically unaffected by improving the regularity of the spark timing. From the results obtained the following conclusions were drawn:

1. Irregular spark timing may appreciably reduce the non-knocking power range of an engine.

2. In the tests described, a change of one crankshaft degree in spark retard was equivalent to an 0.85 in. of mercury change in allowable inlet pressure.

3. Irregular spark timing may cause large errors in tests of the knocking properties of fuels.

4. Spark-timing errors can be determined with reasonable accuracy by causing the spark to puncture combined thicknesses of paper and cellophane tape attached to the engine flywheel.



Effect of irregularities in spark advance on maximum engine performance with incipient knock.

Curves A apply to the condition where the spark timing varied through a range of ± 5 crankshaft degrees while curves B apply to a range of $\pm \frac{3}{4}$ crankshaft degrees.

Calendar of Coming Events

CONVENTIONS AND MEETINGS	
Seventh International Management Congress, Washington	Sept. 19-23
National Lubricating Grease Institute, Annual Convention, Chicago	Oct. 3-4
SAE National Truck, Bus & Railcar Meeting, Chicago	Oct. 4-5
American Society of Mechanical Engineers Meeting, Providence	Oct. 5-7
SAE National Regional Fuel and Lubricants Meeting, Tulsa, Okla.	Oct. 6-7
SAE National Aircraft Production Meeting, Los Angeles	Oct. 13-15
A.S.T.E. Annual Meeting, Pittsburgh	Oct. 14-15
National Metal Exposition, Detroit	Oct. 17-21
American Welding Society Meeting, Detroit	Oct. 17-21
SAE Annual Dinner, New York	Nov. 14
SAE National Transportation Engineering Meeting, New York	Nov. 14-16
National Safety Council Meeting, Chicago	Nov. 14-18
American Petroleum Institute Meeting, Chicago	Nov. 14-18
National Industrial Traffic League Meeting, New York	Nov. 17-18
Automotive Service Industries Show, Chicago	Dec. 5-10
National Standard Parts Association Meeting, Chicago	Dec. 2-3
SAE Annual Meeting, Detroit	Jan. 9-13
SHOWS	
20th Annual National Metal Exposition, Detroit	Oct. 17-21
New York, National Motor Truck Show	Nov. 11-17
New York, National Automobile Show	Nov. 11-18
Pittsburgh, Pa., Automobile Show	Nov. 11-18

Detroit, Mich., Automobile Show	Nov. 11-19
Columbus, Ohio, Automobile Show	Nov. 12-18
Buffalo, N. Y., Automobile Show	Nov. 12-19
Chicago, Ill., Automobile Show	Nov. 12-19
Milwaukee, Wis., Automobile Show	Nov. 12-19
Minneapolis, Minn., Automobile Show	Nov. 12-19
*Philadelphia, Pa., Automobile Show	Nov. 12-19
*San Francisco, Calif., Automobile Show	Nov. 12-19
Boston, Mass., Automobile Show	Nov. 12-19
Los Angeles, Calif., Automobile Show	Nov. 12-20
*St. Louis, Mo., Automobile Show	Nov. 12-20
*Elmira, N. Y., Automobile Show	Nov. 14-19
New Haven, Conn., Automobile Show	Nov. 14-19
Indianapolis, Ind., Automobile Show	Nov. 19-25
Baltimore, Md., Automobile Show	Nov. 19-26
Rochester, N. Y., Automobile Show	Nov. 19-26
Montreal, Canada, Automobile Show	Nov. 19-26
*Washington, D. C., Automobile Show	Nov. 19-26
*Cincinnati, Ohio, Automobile Show	Nov. 20-26
Newark, N. J., Automobile Show	Nov. 26-Dec. 3
Kansas City Automobile Show	Nov. 26-Dec. 3
National Motor Show of Canada, Toronto, Ont.	Nov. 26-Dec. 3
Denver, Colo., Automobile Show	Dec. 5-10

*Tentative

Just *Among* *Ourselves*

Detroit Now the Industrial Hollywood

THE expression may not be new to you, but the other night I was interested to hear Detroit referred to as "The Industrial Hollywood of America." George Brosch, president of Brobuck, Inc., an industrial film producer, was the speaker, and he proved his point. There are four major industrial film producing organizations in Detroit, and their annual volume of business is such that even Hollywood—California—refers to it with respect. Automobile manufacturers and parts companies have been early and heavy users of the industrial film, and the unit slide-film presentation for sales training and consumer reaching. Brosch, whose chief interest is in slide films, believes they are particularly suited for sales training and technical education while the industrial motion picture is better if the public is to be reached directly.

Fay Faurote Made History

FAY FAUROTÉ, who died recently was a publicist in the best sense of the word—he never forgot that public relations implied that there was the public's interest to be considered. Often he was misunderstood, because his mind moved faster than most. He was one of the very colorful figures in the background of the industry's development, and will have his place when the definitive history is written of the industry's first fifty years.

Another One for the Book

JUST caught up with the Labor Day issue of the *United Automobile Worker*, official organ of the U.A.W. Union. On the last page

is an advertisement dedicated to Labor Day. The Copy reads as follows: "Greetings and congratulations on your splendid progress, United Automobile Workers of America. You've done a fine job. Keep it up!" Nothing unusual about that, so far. Then comes the "credit" for the advertisement, and that reads as follows: "This advertisement was prepared and paid for by a group of Automobile Manufacturers who are cooperating 100 per cent with the International Union, United Automobile Workers of America." Nobody seems to know what group of manufacturers is involved, and it has been, I understand, a subject of much luncheon table speculation around Detroit.

Gracefully Bowing to Necessity

LIBERALIZED discounts on new cars sold to dealers, and even more liberal discounts on accessory-group options and special equipment stand out already as being one of the popular approaches to the 1939 sales battle in the passenger-car field. There will be more plans for protecting dealer sales territory; there will be more wooing of dealers by the dealer-council route; there will be considerable price paring to bring certain lines into a more carefully considered competitive position. There will probably be fewer car models offered; more concentration of a price leader in a given line. These are some more of the things which become apparent from a quick dip into the first rising cream of the new model season. There will be more emphasis on comfort and appearance in the new cars than at any time in the history of the industry.

There is a tendency for factory conversations about 1939 to be sober and realistic; soberly optimistic if you like. All of the things noted above contain some of the elements of bowing to necessity, but the bowing is being done gracefully, and I think most of the tendencies exhibited are fundamentally healthy.

HERBERT HOSKING.



In order to give readers of **AUTOMOTIVE INDUSTRIES** a clue to certain merchandising and service aspects of the automotive industry which are normally outside the scope of an industrial publication, we present herewith excerpts from the September issues of the four other magazines published by the Automotive Division of the Chilton Co.

FROM COMMERCIAL CAR JOURNAL

Agitation to keep trucks off the highways over week-ends and holidays appears to be growing. The subject got nation-wide publicity when the American Institute of Public Opinion released the results of a survey. The institute asked a cross-section of voters in all states:

"Do you think freight trucks should be kept off highways during certain hours on Sundays and holidays?"

The vote was: Yes, 73 per cent; No, 27 per cent. The survey found car owners and non-car owners voting in approximately the same ratio in favor of restrictions.

FROM MOTOR AGE

Molded linings came in with the general use of internal expanding brakes about 1925. It is a long jump from the leather linings of the '90's to the marvelous woven and molded linings which we have now. It's a long jump if you look at it that way. But, actually, it wasn't a jump at all. It was a long, hard climb.

The development of the high-speed, reliable and safe cars we have today would have been impossible except for the work which these pioneers in brake lining development did so well. No car of any vintage is better than its brake lining.

FROM MOTOR WORLD WHOLESALE

Elmer F. Andrews, administrator of the Fair Labor Standards Act, is whipping his organization
(Turn to page 358, please)

September 17, 1938

Brake

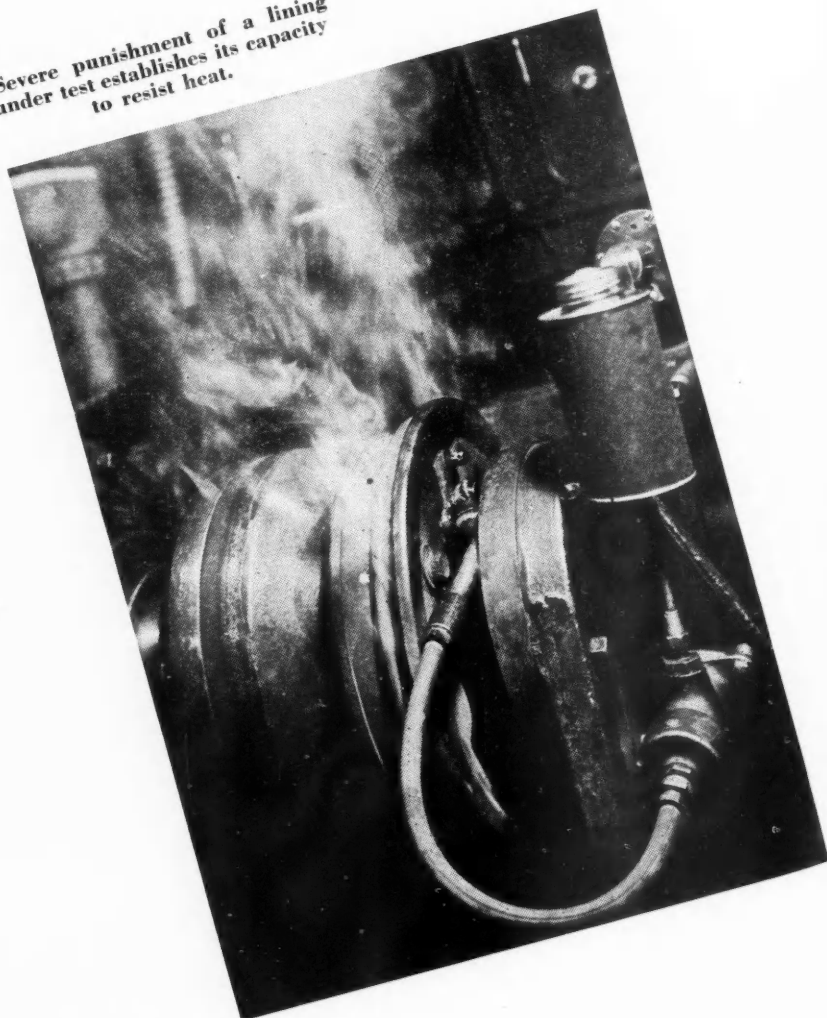
By H. E. BLANK, JR.

ONLY four decades ago the "horseless carriages" of the period were equipped with metal-to-metal brakes which while capable of stopping these vehicles from the current speeds of 10 m.p.h. were objectionable on account of the noise they emitted that palsied novice drivers and severely frightened pedestrians and horses. Engineers who sought to solve the problem by experimenting with rubber and leather belting as a brake lining soon discovered that neither was satisfac-

tory. Shortly after the turn of the century asbestos appeared on the scene to stay. One of the earliest types of linings made of this material was compressed woven asbestos tape. It measured about 5 in. in width and $\frac{1}{8}$ in. thickness. After a coat of white rubber cement had been applied to the surface, the tape was folded into two plies, processed in a calender, and painted black.

Factors that give impetus to engineering research leading to improvements in brake lining and facing materials are the ever-increas-

Severe punishment of a lining under test establishes its capacity to resist heat.



Automotive Industries

Linings—

and other friction materials for automotive use are constantly being improved to meet the challenge of shifting design and rigorous driving conditions

ing speeds of cars and trucks on the highways and the increasing density of traffic on city streets. Operating conditions being imposed upon friction materials are naturally more severe because of these factors, yet high criteria of safety and performance are maintained.

Millions of dollars have been spent by the manufacturers of friction materials for laboratory equipment and in painstaking investigations. The data thus made available to the automotive industry seem to this writer to surpass in importance even the development of new substances. More and more is being learned about the evaluation of the data obtained, and it is hoped that this ultimately will lead to the creation of standards for these materials. However, such standards are believed to be still far off. Manufacturing technique also plays an important role in this industry, and the chief engineer of one large manufacturer stated: "If I should reveal to you the complete formula for our latest-type binding compound, it would be valueless without complete details of our technique of processing and manufacture, which is the product of long years of experience."

Another factor affecting the desirable qualities of brake linings is the design of the vehicle itself. The center of gravity of the car has been lowered to increase its safety. As a result, smaller wheels were adopted, which in turn made necessary the use of brakes of smaller dimensions.

Attempts to embody the streamlining motif in steel bodies brought about deep-drawn fenders, which appreciably reduced ventilation of the brake assembly and resulted in higher brake-operating temperatures.

Supplying brake lining was quite a simple problem years ago, when one type of brake lining would meet the requirements of all makes of cars. This was back in the days when our automobiles were equipped with external brakes with pressed steel drums. Today, the picture is vastly more complex. The wide variety of car models offered is naturally responsible for a large number of different types of brakes which vary in size, type of mechanism, and drum. Another important element is the variation in weight of car with relation to its braking equipment.

An authority in the field emphasizes another detail which adds to the complexity of the situation by

pointing out that "a lining having certain frictional characteristics in combination with cast iron will not necessarily exhibit the same characteristics in combination with steel; conversely, a lining suitable for steel surfaces often is totally unsuited for cast-iron. At present the brake-lining manufacturer must be in a position to furnish all types of lining with a definite range of frictional characteristics."

Asbestos continues to be the principal ingredient of the majority of clutch-facing and lining materials on the market today. The geologist defines asbestos as a fibrous mineral silicate. There are many varieties, although only one, which is known as Chrysotile asbestos, is used as a base material for clutch facings and brake linings. The principal impurities of the raw material are chromite and magnetite. In the process preliminary to fabrication, the magnetite is removed by magnetic pick-up, the chromite by gravity.

Fibers obtained from the mineral vary in length from $\frac{1}{8}$ in. to 6 in. However, the fibers used in manufacturing material for facing and linings average 1 to 2 in. in length. These fibers are silky in texture and in addition to their most valued property of high heat resistance, also are somewhat acid and alkali-resisting. The asbestos fibers begin to lose their water of crystallization (water in chemical combination with the crystalline substance which when driven off by heat is accompanied by loss of crystalline properties) at about 600 deg. Fahr. Loss of water of crystallization proceeds at a rapid rate when a temperature of 1000 deg. Fahr. is sustained. The co-

19
Automotive
Materials

efficient of friction of asbestos in fabric form (running on steel or cast iron drums) is approximately 0.35; in some instances it may go as high as 0.65.

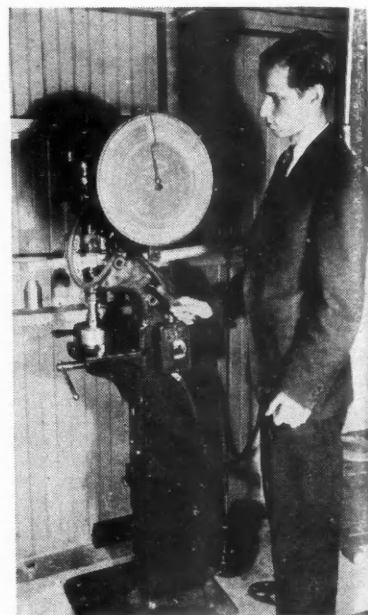
In their search for substitutes chemists have produced synthetic asbestos and processes for making it have been patented in the United States. Germans also have patented a means of producing synthetic hornblende asbestos. Another type called "Rock Wool" can be made by subjecting molten slag to steam blasts, which spin the molten globules into a fibrous mass.

Cotton is frequently introduced as a raw material to make the asbestos base more adaptable to the weaving process, and also to make it easier for the saturant to penetrate into the inner fibers of the lining. Cotton, which is highly absorbent, must be treated to make it resistant to water,

such injurious effect. Says this authority: "Brass of this type anneals or softens under heat, whereas other copper and aluminum alloys and steel all have a tendency to harden."

Advantages of lead are that it tends to stabilize the coefficient of friction, acts as a dry lubricant preventing drum scoring, and inhibits the formation of abrasive particles on the friction surface. It has been found that lead or lead alloy wire, the same as the zinc constituent in brass, disappears under the effect of intense heat generated in service, leaving only the fabric at the surface.

Claims advanced in favor of zinc wire incorporated into brake lining parallel those mentioned for lead. Proponents of its use hold that the zinc will fill in tiny pores on the drum surface, with the effect that the surface is polished and scoring is inhibited. This theory has been questioned by



Friction materials one square inch in area can be tested on this Bendix Button type of machine.

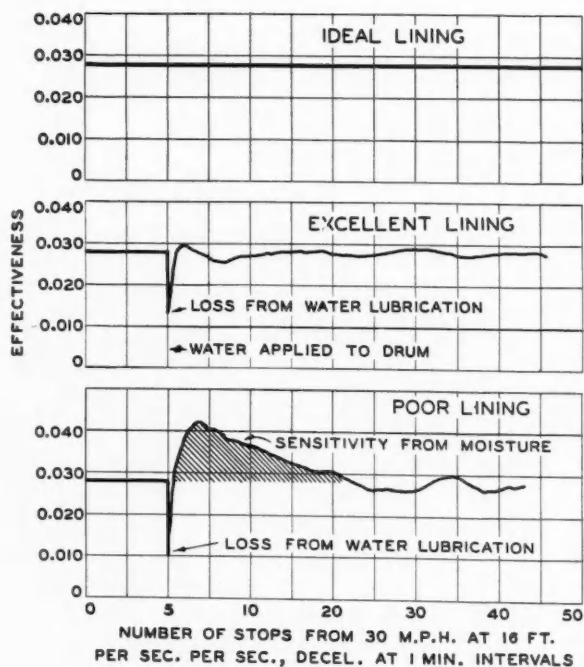


Chart showing the water and moisture reaction of three types of lining classified as ideal, excellent and poor. The excellent and poor types are commercial brands of lining, whereas the "ideal" type is existent in theory only and is charted above for comparison. Shaded areas above the normal line indicate the sensitivity zone.

oil and grease. Brass wire has been incorporated into brake linings for many years, while lead and zinc, as well as alloys of these metals, have come into use only recently. One authority points out that when lining containing brass wire is subjected to high operating temperatures, the zinc constituent of the brass will melt out, with the result that a wire composed virtually of copper remains. While some have claimed that this tends to score drums, his experience has been that it has no

others who point out that lead or zinc particles would not readily adhere to these minute craters in the drum surface, especially when coated with a glazed film of carbonized material which is the natural result of service.

The wire is usually incorporated into the woven lining by twisting the strands of cotton, asbestos, and metal wire into a yarn.

There are four main types of friction materials: Molded, woven, folded and compressed, and impregnated

asbestos-sheet. Short-fiber asbestos is the raw material for most molded-pulp types; after being compounded with inert pigments it is bonded with drying oils, rubber, or synthetic resins. In the final fabrication the mass is formed under hydraulic pressure and heat. A number of types of woven lining are offered today. One form is made of a yarn of asbestos which is woven into tape form, saturated, rolled to size, and subjected to a heat treatment. Another utilizes the same asbestos yarns, into which pigments are introduced in conjunction with a binding compound. The folded and compressed materials are made up from woven-asbestos cloth. After the cloth has been impregnated with rubber compound and other inert material, it is folded into plies, then compressed to finish thickness, and vulcanized. Impregnated asbestos-sheet is manufactured with asbestos-sheet as a base, which is impregnated with a binder, then formed, and finally heat treated.

Much research effort has been spent on binding materials. One of the most essential properties of these materials is high heat-resistance. They should be even more heat resistant than the asbestos itself, as present-day operating conditions make it desirable to protect the asbestos fibers with this impregnating compound. Among the few substances held to be desirable for this purpose are coal-tar products, including asphalts and pitches, synthetic

resins, mineral and vegetable oils, and rubber.

While asbestos fibers and the bonding material comprise the essential ingredients of modern brake linings and clutch facings, numerous other substances are introduced to obtain particular characteristics. These are referred to as fillers, accelerators, reinforcing agents, and catalysts. They fulfill various functions and are mainly intended to enhance the frictional characteristics of the lining, increase life, resistance to oil, water and grease, and to further increase resistance to heat. In some types of brake-lining and clutch-facing material now on the market there are as many as 20 different addition agents.

Increasing severity of service conditions and the constant pressure for improved performance of friction facings and linings also have led to the development of friction materials with a metallic base. One brand consists of copper mixed with tin and lead in powdered form, together with certain non-metallic constituents. The metals provide the necessary mechanical strength, while the non-metallic materials control the friction properties. Two kinds of non-metallic constituents are used—one tending to decrease, the other to increase the friction coefficient. The former includes graphite and powdered mica, both of which have lubricating qualities, while representatives of the latter are silica, clay, carborundum, and fused aluminum oxide.

The manufacturing process includes thorough mixing of the powdered constituents in the desired proportions, and introduction of the mixture into metal molds or dies. Facings are formed under high pressure and later given heat treatment in a non-oxidizing atmosphere. Temperatures range between 1000 deg. Fahr. and the fusing point of the most fusible metal in the mixture. As a result, the metallic components are "welded into a continuous, porous, malleable mass, the pores being filled with the non-metallic constituents."

Clutch facings made by this method are claimed to have a lower friction coefficient than the asbestos-base type, to give a more gradual pick-up, and to generate little, if any, greater heat. Owing to the lower friction coefficient, an advantage claimed is that no matter what temperature the lining may attain in service, the friction characteristics and wear are not appreciably influenced, because the whole has been heat treated at a temperature that is never reached in actual service.

Inasmuch as testing equipment has

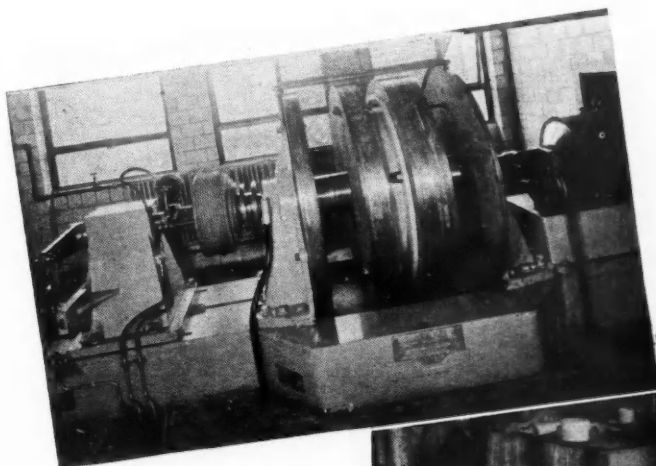
contributed so materially to progress in this field, it seems appropriate to briefly describe some of the equipment found in the well-equipped laboratories of friction-material manufacturers. The general tendency has been toward the development of equipment that will accommodate the complete brake assembly of any of the popular vehicles and which is as nearly automatic in operation as possible.

It seems to be the consensus of opinion among informed individuals in this field, that laboratory testing equipment which does not incorporate facilities for mounting and investigating the full brake mechanism is virtually valueless as a means for determining the performance characteristics of various types of lining. While many favor road tests for gaging the overall performance of friction materials, the view is also held that laboratory machines are now so improved that they yield "identical data", and that the advantage of laboratory tests will increase as automatic control of these machines is developed further.

A typical machine for testing automobile brake linings is known as the inertia-weight type. One such machine consists of a dynamometer on

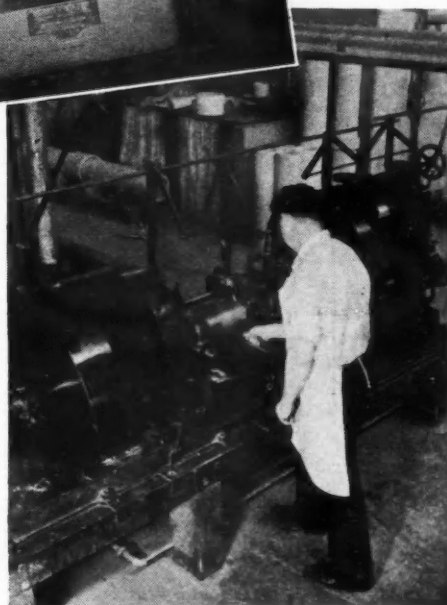
which brake drums and backing-plate assemblies carrying the shoes and related parts are mounted. This particular machine is equipped with a cast-steel flywheel weighing about 600 lb. Flexibility of the set-up is provided by 44 steel discs $\frac{1}{4}$ -in. in thickness and weighing about 112 lb. each, which may be added to simulate one-quarter the weight of the vehicle on which the brakes are to be mounted. In operation the flywheel is brought up to a speed corresponding to a certain car speed by an electric motor; the power is then cut-off and the brake applied to absorb the kinetic energy stored up by the flywheel. The speed range of the flywheel is 205 to 820 r.p.m., which with 30-in. wheels corresponds to car speeds of 18 to 73 m.p.h. The kinetic energy stored in the flywheel alone is thus varied from 8120 ft.-lb. to 133,500 ft.-lb. The complete set of discs provide a kinetic-energy range from 59,500 ft.-lb. to 980,000 ft.-lb. This range corresponds to one-quarter the kinetic energies of cars weighing from 3000 to 22,000 lb., at their normal speeds.

Other brake lining testing machines are generally similar to the



(Above) One of the most modern of the inertia-weight type machines for testing automobile brake linings.

(Right) An experimental rubber mill and calender. This set-up duplicates, on a small scale, a full-size factory machine and is used in the development of new frictioning compounds.



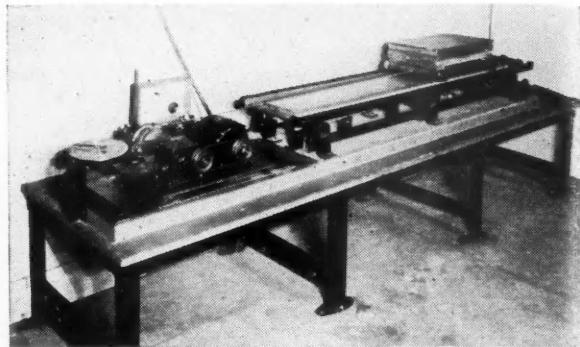
one just described. Higher flywheel speeds are sometimes used, and the descriptions of newer equipment state that one improved machine has an automatic-time-cycle clock which makes possible a change in the interval between stops from practically nothing to 10 minutes.

General Motors Corp. laboratories developed what is known as the Chase machine which has proved very useful in evaluating the qualities of friction materials. Laboratories using this machine in some cases have made a number of modifications in its operation and method of control. Only small samples of lining can be tested on this machine. Three one-inch-square pieces are subjected in it to a pressure of 50 lb. per sq. in. In one large laboratory tests on this machine are made at a rubbing speed of 10½ ft. per sec.

The Carson is a machine which is similar to equipment now in use at the Bureau of Standards in Washington. With this equipment, also, only small pieces of lining can be tested.

The Bendix Button Machine, a development of the Bendix Co., also serves to test small pieces of lining.

A friction materials testing machine of the flat plate type which is used to determine coefficient of friction. This machine is designed so that the plate can be heated.



Specimens are placed in the machine and a small button is rotated against them, the machine indicating the torque required to rotate the button.

Still another machine is designed to indicate the coefficient of friction when the materials are dragged over a flat, steel plate. The temperature of the steel plate can be varied, which makes it possible to study the influence of temperature on the friction characteristics of small pieces of lining.

An important piece of equipment

is the Cowdrey brake testing machine, which is frequently used to test the vehicle brakes as a preliminary procedure to sending cars out on road test.

Tests on brake linings and clutch facings must still be made on vehicles run over typical roads, inasmuch as certain information regarding the behavior of these materials cannot as yet be obtained by laboratory machinery. In such road tests the car is equipped with a certain make of brakes and lining, and the brake mechanism is set according to the manufacturer's instructions. Instrumentation is provided for the measurement of pedal pressures, rate of deceleration, drum temperatures, etc. In general, these road tests serve to give data on the performance of lining and clutch-facing materials under actual road conditions. The "test procedure" calls for careful installation of the material to be tested, with adjustments as specified and mounting of instruments for indicating and recording the data desired. Preliminary runs are made at moderate speeds with some applications of the brake. The overall performance is then observed by a series of brake applications made under conditions which are made as nearly uniform as possible. An attempt is made in these runs to hold the rate of energy absorption constant during a definite cycle. The test schedule may comprise a series of stops made in cyclical routine at certain speeds on a road surface which is approximately flat. Another procedure entails a number of brake applications over a road course which includes both level and hilly sections.

Other tests are made for performance under conditions of deceleration, for fading, recovery, water—recovery, and durability. These will be described briefly.

Deceleration tests, as the name implies, are made by stopping from certain speeds, with pedal pressures

Brake Lining Manufacturers

Alltex Products Corp.	New York N. Y.
Allbestos Corp.	Germantown, Penna.
American Brakeblok Corp.	Detroit, Mich.
Asbestos Manufacturing Co.	Huntington, Ind.
Atlas Asbestos Co.	North Wales, Penna.
Bondall Co.	St. Louis, Mo.
Buffalo Weaving & Belting Co.	Buffalo, N. Y.
Burrell Belting Co.	Chicago, Ill.
Emsco Asbestos Co.	Downey, Calif.
Ferodo and Asbestos, Inc.	New Brunswick, N. J.
Fibre Manufacturing Co.	Newton, N. C.
Firestone Tire & Rubber Co.	Akron, Ohio
Garlock Packing Co.	Palmyra, N. Y.
Gates Rubber Co.	Denver, Colo.
Gatke Corp.	Chicago, Ill.
General Asbestos & Rubber Division of Raybestos-Manhattan, Inc.	North Charleston, S. C.
Hoosier Friction Products Corp.	North Manchester, Ind.
Johns-Manville Corp.	New York, N. Y.
Keasbey & Mattison Co.	Ambler, Penna.
Lasco Brake Products Corp., Ltd.	Oakland, Calif.
Manhattan Rubber Manufacturing Division of Raybestos-Manhattan, Inc.	Passaic, N. J.
Marshall Asbestos Corp.	Troy, N. Y.
Miley Company, L. J.	Chicago, Ill.
Palmer Asbestos & Rubber Co.	Louisville, Ky.
Pioneer Asbestos Co.	St. Louis, Mo.
Raybestos Division of Raybestos-Manhattan, Inc.	Bridgeport, Conn.
Rex-Hide, Inc.	East Brady, Penna.
Rosendale-Reddaway Co.	Newark, N. J.
The Russell Manufacturing Co.	Middletown, Conn.
Scandinavia Belting Co.	Newark, N. J.
Smith Company, E. M.	Los Angeles, Calif.
Southern Friction Materials Co.	Charlotte, N. C.
Standard Brake Lining Co.	Los Angeles, Calif.
Swan Rubber Co.	Bucyrus, Ohio.
Thermoid Co.	Trenton, N. J.
Triplewear Brake Linings Corp.	Paterson, N. J.
Union Asbestos & Rubber Co.	Cicero, Ill.
United States Asbestos Division of Raybestos-Manhattan, Inc.	Manheim, Penna.
Wellman Co., S. K.	Cleveland, Ohio
Wood Insert Brake Lining Co.	St. Paul, Minn.
World Bestos Corp.	Paterson, N. J.

varying from the slightest which is still effective in bringing the car to a full stop, to a maximum that will cause skid. The time intervals between brake applications are made sufficiently long to allow time for cooling as it is considered desirable to approximate the same drum temperature for each stop.

Fading tests are made to study the performance under conditions of increasing temperature. The procedure calls for brake applications in quick succession, usually from relatively high speeds. Either the pedal pressure is held constant and the deceleration rate is observed, or vice versa. The recovery test which is made immediately after the fading test, consists of a series of brake applications made at slightly longer time intervals, while the drum temperature returns to normal.

The water-recovery test shows the performance after the brakes have been thoroughly saturated with water. Sometimes the cars are run into immersion tanks, while in other cases the brakes are wetted with a hose. As in the fading test, the pedal pressure may be held constant and the deceleration rate observed, or vice versa.

To obtain data on the durability of the material, thickness measurements are taken at the beginning of the test and at intervals thereafter.

Correlation of road test data with laboratory results continues to be difficult. For one thing, laboratory machines are set up to supply data for one brake only, under conditions which simulate one-fourth the weight of the car. One thing in favor of the laboratory test is that it is more economical, especially now that so many different combinations of lining materials may have to be investigated. The cost of a fleet of vehicles necessary to make thorough road tests would be prohibitive.

Owing to the fact that so many different elements must be given due consideration, it is extremely difficult

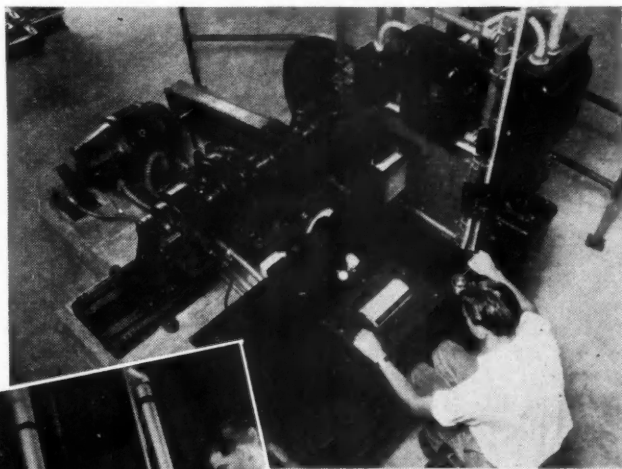
to measure the over-all performance of a brake-lining material. The chief engineer of one of the most prominent manufacturers of friction materials states that "there are four important major performance qualities in a friction material. First and foremost of these is friction; the second is durability, the third, relative freedom from any tendency to score drums, and the fourth, the quietness of the lining in operation."

Under the friction characteristic there are four subdivisions listed by the same engineer as follows: temperature reaction, aging qualities,

water reaction, and oil and grease reaction.

As regards temperature effects, one manufacturer has found it convenient to establish five temperature zones in which the coefficients of friction of the material are determined; viz., 160, 350, 500, 800, and 1000 deg. Fahr. The accompanying charts which show the various characteristics of three different types of lining—ideal, excellent, and poor—were furnished by this same manufacturer.

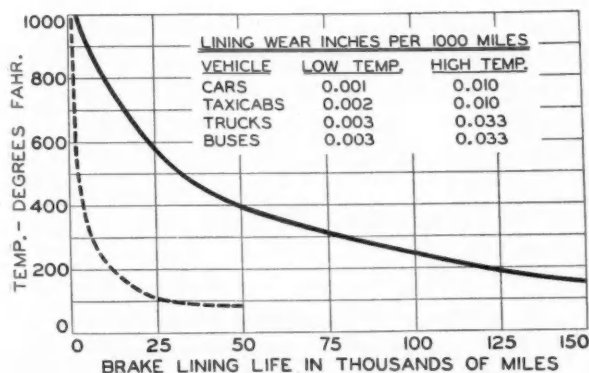
Aging seems to have opposite effects on different friction materials.



(Above) A general view of an inertia type machine in use in the laboratory of a large friction materials manufacturer. The machine makes it possible to simulate a variety of conditions ranging from mild to severe service.

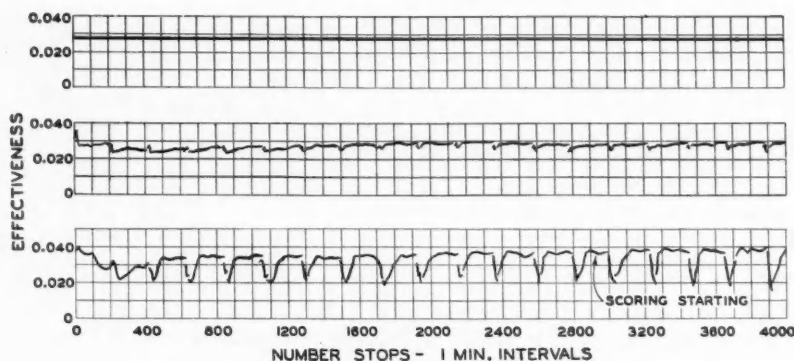


(Left) A high-speed centrifugal clutch facing tester which is used to determine the r.p.m. at which a given clutch facing will break down due to centrifugal force.



This chart roughly illustrates the life which may be expected from friction materials when operated in different temperature zones. The dotted line approximately represents linings which were considered excellent 10 years ago.

One lining may exhibit a tendency to decrease in frictional value in operation, with the result that the vehicle develops what is called a "hard pedal." Another may exhibit the opposite tendency, the brakes becoming noisy and may score, due to the fact that the plastic binder has dried out under the influence of high temperatures, leaving harsh ingredients of



The above graphs show the results of a study of aging characteristics of two linings. Of the three types of linings considered—ideal, excellent and poor—only the last named two are commercial brands. The "Ideal" type is purely theoretical and charted to facilitate comparisons.

The top chart refers to the ideal type, the second to the excellent, and the bottom to the poor. Note the friction fading tendencies of the poor lining.

At the end of the test it was found that the excellent lining was in good condition. Its surface was glassy and slightly scaley. The brake drum was smooth.

The poor lining at the end of the run was cracked and spread. Its surface was scored and rough. The brake drum, also, was scored.

the asbestos fibers and dry compounding ingredients in contact with the drum.

With some linings water on the friction surface may cause a variation in friction coefficient as great as that due to excessive temperature. There is what is called a sensitivity zone with respect to water content which is responsible for temporarily squeaky brakes. The quantity of water which must be absorbed to bring about this condition is so small that it cannot be measured by a delicate balance.

Commenting on the effects of lubricating oils and greases on friction materials, one friction materials engineer made the following statement: "To me, it seems that we are making a burlesque of the friction-material business when we are forced to build materials that will resist the action of lubricating oils and greases. We are simply discussing the greatest paradox in the world when we talk of lubrication and friction in the same breath. However, it seems that today linings must have a reasonable amount of resistance to the action of oil and grease."

It has been found desirable to make linings as highly grease-and-oil-resistant as possible. A sample of an excellent brake-lining material weighing 106 gm. was immersed in hot oil at 212 deg. Fahr. for a period of seven days. It absorbed 1½ gm. of oil. A poor variety of commercial lining, weighing 110 gm., was immersed in oil under the same conditions of temperature and time, and absorbed 5½ gm.

The greatest improvement in fric-

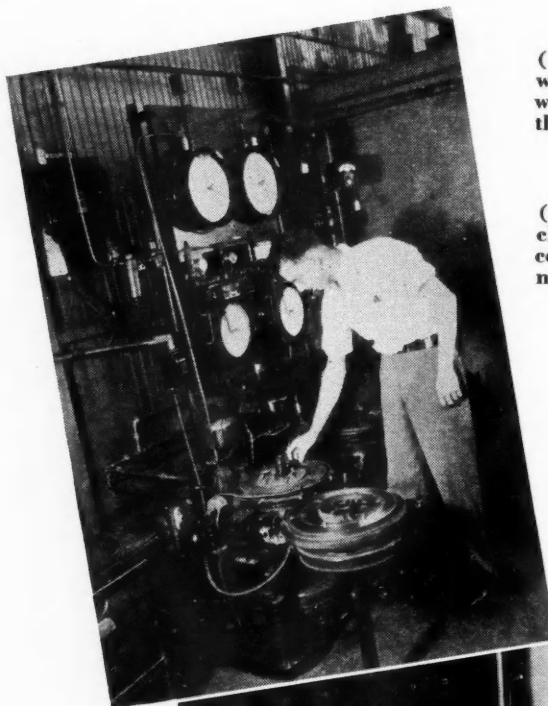
tion materials has been in the wear factor. Today, provided operation is intelligent, good linings hold up sat-

isfactorily for the life of the vehicle.

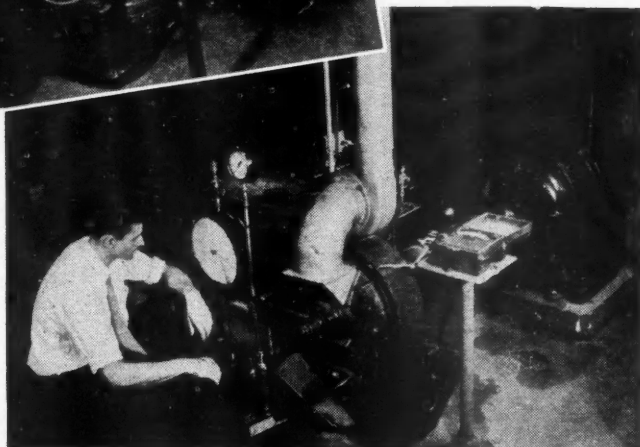
Whether drums will be scored by a lining depends to a large extent on the "general compatability" between the lining and the drum. "Drum manufacturers, the same as manufacturers of friction materials, are constantly seeking to improve their product. As one result of this effort the past few years witnessed a virtually complete change-over from pressed-steel to cast-iron drums.

Tests have shown that pressed-steel drums score much more quickly than those of cast iron. The type of drum having maximum resistance to scoring is one having a structure with a pearlite content in spheroidal form, the spheroidal pearlite particles being surrounded by free graphite and this combination floating, so to speak, in a matrix of ferrite.

Noisy brake action can be attributed to the lining, to faulty brake construction, or to incorrect adjustment and poor lining installation. Commenting on the use of brake lining materials in service, one engineer observes that modern brakes



(Left) The General Motors wear testing machine which is used to determine the wear resistance or life of friction materials.



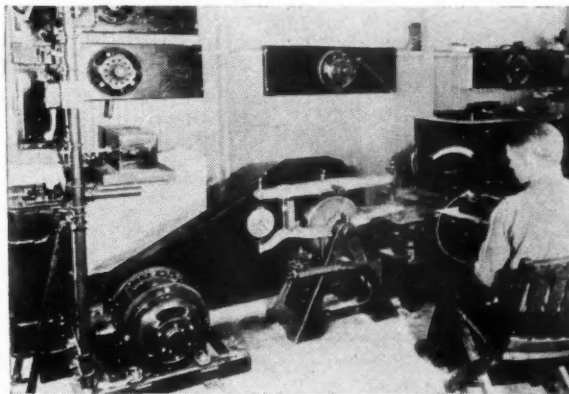
(Below) The Borg & Beck clutch facing tester which consists of a standard automotive clutch set-up driven by an electric motor.

will give excellent performance provided the vehicle on which they are mounted is operated within its capacity. As regards the capacity of brakes for passenger vehicles, a load factor, obtained by dividing the gross vehicle weight by the area of the brake lining, should not exceed 30 lb. per sq. in. For trucks this factor may be increased to 40 lb. per sq. in., and possibly 50. Where the higher ratios obtain, it is advisable to use a brake lining of high friction value. This can be done only at the expense of durability, as materials with a high coefficient of friction perform relatively more work. Laboratory tests show that the durability of linings decreases as the load factor increases.

Here, again, other factors enter the picture, one of these being the increased operating temperatures due to restricted ventilation in modern streamlined vehicles. Insufficient clearance between brake drum and tire rim is another such factor. As regards the effects of streamlining, some tests were made to discover whether any advantages would result from plates arranged to deflect the airstream so that it would cool the brake assembly. The engineers who did this work were amazed to find that air blown from a jet at 50 lb. per sq. in. failed to penetrate the air stream when a traveling speed of 50 m.p.h. was simulated.

The effect of excessive temperatures on friction materials deserves to be discussed somewhat more fully. As previously explained, the friction material is made up of asbestos fibers in combination with inert

A Carson machine used for studying certain properties of friction materials. Only small samples of lining can be studied with this equipment.



mineral ingredients and binder compounds. The physical characteristics of asbestos fibers have been given in the foregoing. Of the inert mineral ingredient incorporated into friction materials there are only a few which retain their original characteristics when subjected to temperatures above 1500 deg. Fahr. Some of the organic binders begin to show injurious effects at a temperature as low as 350 deg. Fahr., and most of the heat-resistant types are affected to some degree at 700 deg. Fahr.

Good proportioning of the various ingredients combined with the asbestos and the final manufacturing process involving compression at high pressure, overcome to a certain extent the temperature-susceptibility of the friction materials. In service, the surface of the lining or clutch facing may break down under high operating temperatures but the material underneath retains its

original structure, which is due to the fact that the final product has a rather low heat conductivity and the excessive temperatures do not penetrate deeply. However, in continued operation under conditions of excessive temperature any friction material will break down. The surface material is continually disintegrating and abrading, thereby exposing a new surface with the same result. But, as one author points out, the advances made in friction materials have brought them to the point of resisting break-down up to temperatures which also threaten the brake drums.

We like the statement of an outstanding engineer in the friction materials field who sums up the progress made with the comment that linings are commercially available today which "should last for 50,000 miles on taxi cabs operated in New York City, with a half-way chance from the driver."

Automotive *Materials* NEW DEVELOPMENTS

Styrol and Acrylic Plastics in New Automotive Use

Certain forms of the new polystyrol and acrylic plastics have the property of transmitting considerable amounts of light edgewise in sheets or lengthwise in rods even though these be bent into circular form. Advantage is taken of these properties to illuminate the dials of aircraft instruments in a new form of "ring lighting" developed by the

Pioneer Instrument Co., Brooklyn, N. Y.

Die-cast aluminum bezels or fronts for these instruments equipped for ring lighting are now being produced for Pioneer instruments and are offered for application also on instruments of other makes. The fronts contain a pair

of the plastic rings. A so-called "grain of wheat" lamp, one of the smallest incandescent lamps produced, is used. This lamp is mounted in a screw base and is removable from the front of the instrument. It projects into a light well only $\frac{1}{4}$ in. in diameter. One of the plastic rings is split and its

polished ends are inserted into the wall of the light well where they are fixed only 0.009 in. from the minute light bulb. Light from the bulb travels from end to end of the ring in both directions and completely around the dial.

Much of the light, however, escapes through the side walls of the ring which rests in a white painted recess of the die casting, being reflected from the walls of the latter. Some light also passes radially inward without being reflected. A second and continuous ring of the same plastic fits closely inside the split ring and is so painted on some surfaces as to effect a uniform diffusion of the light over the surface of the instrument dial. Some of the painting is done in blue to neutralize a slight yellowing of the light resulting from a diffractive effect through a part of the circumference. The inner ring also produces a seal where it bears against Corprene gaskets against the cover glass (which is laminated) on one side and against the instrument case on the other side. These plastic rings take the place of glass rings formerly used and are much less fragile and are also lighter than the glass rings. The net result of the new design is said to be uniform and glare-free lighting of the instrument dials which is of special importance in night flying.

Electrochemical Coloring for Metallic Surfaces

Plastic-Plate is a trade name given to a nitrocellulose coating which can be applied to metal, glass, molded products and wood by a method of dipping.

The parts to be coated by this process are racked as in electroplating and then mechanically dipped in a bath of nitrocellulose. The thickness of coats thus applied may be between 0.003 in. and 0.10 in., controllable within a 0.002 in. limit. The average thickness of coat is 0.007 in., and the maximum 0.020 in. The thickness of coating is governed by the viscosity of the material and the speed at which the article is rotated through the dip. The coating air-dries, and 20 minutes after it is dipped, it can be handled and removed from the rack. Four hours after dipping, a part having a 0.10 in. coating can be trimmed and packed for shipping. Very little or no buffing is required as the coating dries with a smooth surface and high luster.

An infinite variety of colors and textures are said to be made possible by this process just as in lacquers, enamels and plastics—transparent, translucent, opaque and pearlescent, as well as the metallic effects, obtained with metal pigments are possible.

In comparison with nickel or chromium plating, plastic-plate is non-porous and is claimed to be superior to plating in acid resistance, salt spray, abrasion and aging tests.

Plastic-plate contains no gums or resins and does not become brittle, nor is its strength effected over long periods of time.

In applying this coating over a die casting, the manufacturer states that there is no need for high surface soundness as is required for electroplated parts, as the coating will smooth out or hide small nicks and run marks on the surface. However, where there is a large indentation, embossing, engraving, grooves and the like, thorough detail can be obtained due to the great pliability of the material.

The coating can be applied over irregular shapes and sections, although there are some parts so shaped that it is impossible to apply coating to exceed 0.010 in. thickness. Generally, coating is uniform throughout.

Where the shape, size or design of a part is such that dipping becomes uneconomical or impractical, a spraying method has been developed in which heavy coats of the order of 0.0003 in. can be applied by means of a special spray gun developed for the material.

Nitrocellulose Coating With Wide Application

Metallic surfaces can now be colored by electro-chemical means, producing color combinations of film thickness, by a process trademarked "Electrocolor."

These colors are produced in a plating bath of a water solution containing copper salts, in which the article to be finished is immersed and serves as the cathode or negative pole. Copper is used as the anode or positive pole in the circuit. The deposit consists chiefly of copper oxide. The bath is operated at low voltage (approximately 0.40 volt), with a current density of approximately 0.5 amp. per sq. ft. The length of time of plating may run from 1 to 30 minutes, dependent upon the color or depth of color desired.

All of the colors produced by this process are obtained from one plating bath, the color being a function of the length of time that the article remains in the bath. As the length of time of plating increases, the color changes successively from violet to blue, green, yellow and red in cycles. This cycle of color changes as the plating is continued, but with each succeeding cycle, the color becomes deeper and darker.

The condition of the metal surface before plating also determines the final shade and luster. A highly polished surface gives a bright finish, and a scratch-brushed surface gives an egg-shell finish. Different colors may be obtained by different metal bases, such as plated deposits of copper or nickel. In every case brilliance of the final finish depends upon the surface condition of the base metal.

Zinc die castings to be treated by this process must be first plated in either copper or nickel prior to color plating.

Any shade or color once produced can, according to the manufacturer, be duplicated and matched with accuracy by a knowledge of the base metal, the surface finish and the length of time in the plating bath. Control of the composition of the plating bath, the temperature and operating conditions of voltage and current density are essential.

Variations and additional effects can be produced by special treatments. Two-tone effects can be produced by stopping off a part of the area to be colored for a portion of the time. It is also possible to obtain combinations of chromium plate and color by stopping off parts of the article prior to chromium plating, then coloring the exposed portions, leaving that part which is chromium plated unaffected.

Glass Fabric Base for Bakelite Laminated

Synthane Corp., Oaks, Pa., has announced the introduction of a new Bakelite-laminated material. A woven glass fabric base is used in this material in place of the usual paper or fabric. Tests are reported to show that glass gives a low moisture absorption which had not been duplicated previously in laminated phenolic resinoid materials. Other advantages claimed are a minimum change in electrical characteristics, and greater resistance to the action of corrosive liquids.

Diesel Oddities

"DIESEL Oddities" was the title of a paper presented at the S.A.E. Summer Meeting by C. G. A. Rosen of the Caterpillar Tractor Co. The majority of Mr. Rosen's oddities consisted of accounts of unusual experiences in placing Diesel tractors in service in various parts of the country, or in tracing the causes of abnormal behavior of the engines. Following are a few samples of the "Oddities."

In Arkansas, a fleet of Diesel tractors showed considerable wear from corrosion of the injection-pump plungers. At that time the factory, for its own information, maintained an exchange service, worn or improperly functioning fuel-injection equipment being returned to the pump factory, and a calibrated and standardized replacement unit obtained from the dealer, which made it possible to keep the tractor in operation without making field adjustments. In the meantime, the returned unit was thoroughly inspected at the factory, and a report on it was made to the engineering department.

Repetition of the corrosion trouble in the same locality led to the issuing of an order for a chemical and physical analysis of the fuel contained in the body of the pump assembly. To receive credit consideration, replacement units had to be properly sealed, and a fuel sample was, therefore, obtainable. The investigation revealed that the tractor owner was dumping his used crankcase oil into the fuel tank and, to his great satisfaction, achieved phenomenal fuel economy.

In a northwestern dam-construction job, a careful contractor had read much about "clean fuels." He had read that Diesel fuel was scrupulously cleaned at the refinery, but that transportation and delivery contamination often occurred. At least he was going to keep his fuel clean, and so he purchased new galvanized pipe and a galvanized fuel-storage tank, for the sake of cleanliness.

In a short time excessive pump-plunger wear became evident. How could this be possible when such care had been taken to keep the fuel clean?

Subsequent examinations and tests

showed that the Diesel fuels (not being neutralized) converted the zinc coatings of the pipe and tank into zinc soaps. Factory tests showed these zinc soaps to be highly abrasive, and to cause destructive wear when they got into the small clearances between the plunger and barrel seals. When a certain concentration of the soap was reached, the rate of wear was of about the same order as with the finest rouge.

In one of the Hawaiian group, a sugar plantation grows cane on a high plateau, and the sugar mill is down by the sea, close to the shipping dock. Years ago a problem arose in connection with delivery of the cane down the steep slopes to the mill. Sufficient water was not available for sluicing the cane, so, finally, a railway was built. The cane was loaded on the heights into cane cars. To the rear end of the cars a number of oxen were tied by means of bull chains. The cars were then released, and the cane and the cars and the oxen finally settled a downhill argument at the mill. This practice was continued until gasoline tractors were introduced.

The gasoline tractor was then substituted for the oxen, and in a short time it earned the title of "airplane tractor." Some annoying problems resulted, for the reason that the tractor coasted down hill behind the cane cars on compression, with the ignition cut off.

Adaptable Diesel

The return uphill proved dangerous and often exciting, because the crankcase often became loaded with gasoline vapors. When a sufficient temperature was developed on the uphill grind, the crankcase doors would often blow out from an explosion within. The great dust clouds created during the down-hill plunge precluded the use of crankcase ventilation, but the plantation mechanic solved the problem by putting springs on the crankcase doors. "Let her blow," was his order to his drivers from then on.

The advent of the Diesel tractor eliminated this danger, as a simple device was fitted allowing the pistons to perform negative work in braking

the cars down-hill, and the fuel, of course, was completely shut off for this part of the transportation schedule. Thus, a special requirement was effectively met with the aid of the Diesel principle.

The dust-sealed crankcase of the tractor Diesel prevents the use of well-known automotive ventilating methods. Inasmuch as the temperatures of the connecting-rod bearings are directly proportional to the enclosed crankcase air, dangerous temperatures are reached in small, fast-running Diesels in regions of high atmospheric temperature.

In Diesel-tractor operation, when jacket temperatures are held to about 175 deg. Fahr. for efficient combustion, some other coolant had to be used for the lubricating oil. The air-cooled oil cooler, ahead of the radiator, solved the problem and gave a considerable margin of safety.

New equipment introduces new problems. Down on the levee near Memphis, Tenn., when the Diesel track-type tractor was young, the teaching of negro drivers presented some headaches.

Another Problem

Although the negro labor employed by most levee contractors was adequate for operating duties, the drivers were not allowed to take care of any mechanical trouble that might arise. A special service man was called in for every job.

One negro operator, by pure accident one day, found that when the valve leading from the fuel tank to the fuel transfer pump was shut off and the engine run until dry of fuel, it could not be started again until the whole fuel system was bled of air and then reprimed with fuel. The driver didn't know what actually happened to cause this, or if it did harm, but he did know that he got 30 or 40 min. rest while a serviceman was routed out, brought to the job, and set to work bleeding the lines.

Other operators who liked to have an extra rest period now and then, learned the trick, and for days there was a veritable epidemic of engine failures. Even when the cause was suspected, the drivers could not be discouraged, and there was soon more rest than work on the job. Most of the operators found that if they turned the valves during the night shift, they could expect an hour or more of idleness, for it took

(Turn to page 358)

By JOSEPH GESCHELIN

WHEN a service station operator—or what is worse—when an owner grabs the door handle of his car, thereby becoming the conductor for a high tension static electricity discharge of some 7500 to 10,000 volts, the reaction is both violent and voluble. While static charges on passenger cars are of uncommon occurrence, statistically, in the small percentage of complaints that come to the factory the situation is charged with all the elements of serious trouble.

merable causes for the disturbance, some quite beyond the control of the car manufacturer. Nor is it an easy matter to reproduce the phenomenon at will if one wishes to study it.

Some facts are presented here in the interest of arousing discussion and, perhaps, to set down some ideas that may not be well known. The

STATIC

electrical engineers in particular, there are several schools of thought on this subject. Some are inclined to investigate all possible sources of dry friction while others feel that there is but one cause. On the basis of the present knowledge, it may be safer to consider every known source of dry friction.

When a car is traveling on the highway, it is subject to the accumulation of static charges from a variety of sources, among which are the following:

Air flowing over the sheet metal surfaces;

Brake bands rubbing on brake drums;

Friction of belts on fan and accessory pulleys;

Scrubbing of inner tubes against tires;

Flexing of tire side-wall;

Friction of tires on the pavement;

Gasoline or oil sloshing against gas tank or oil pan;

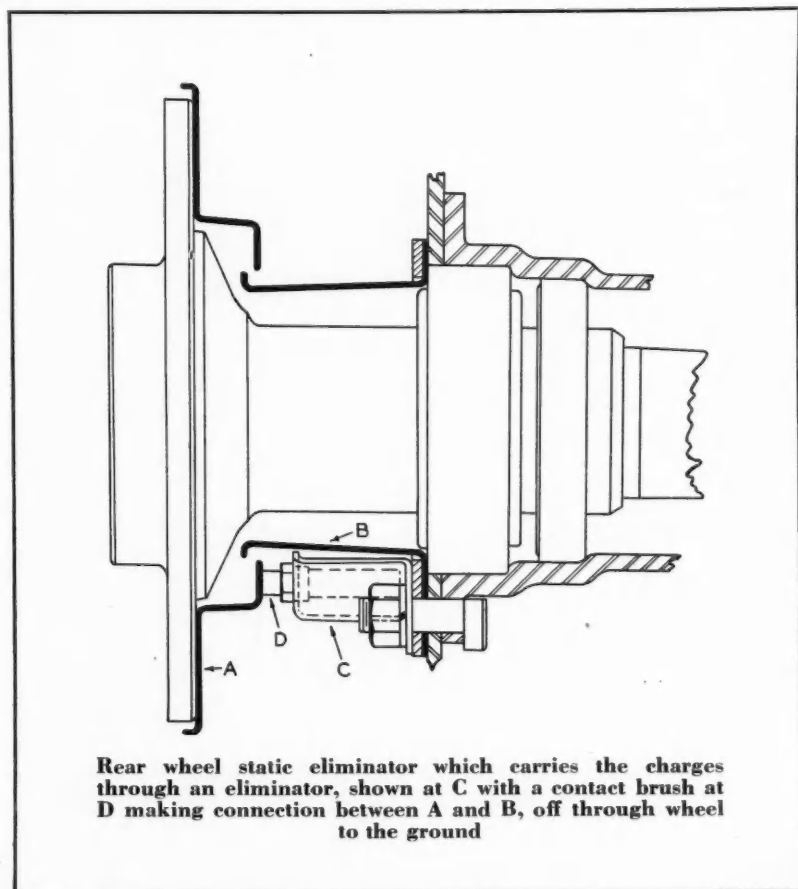
Friction of seat covers against upholstery;

Friction of clothing against upholstery;

All types of seals where there is dry friction;

Static charges must not be confused with those charges produced by defective wiring in the ignition system or in the radio circuit where high voltage circuits may be accidentally grounded. These causes may be easily detected by a competent service man and can be readily corrected.

According to the experience of the tire engineering and service division of U. S. Rubber Products, Inc., under low humidity weather conditions, static is generated to some extent in all automobiles and it is only in an estimated *one per cent*, that it becomes objectionable. The magnitude of the static charge is determined by a balance between the quantity of static generated and the amount that leaks away. Generation and dissipation are continuous processes which depend almost entirely on atmospheric conditions and the type of road traveled. The majority of auto-



Rear wheel static eliminator which carries the charges through an eliminator, shown at C with a contact brush at D making connection between A and B, off through wheel to the ground

At one time or another motor car manufacturers have been faced with this complaint. It comes and goes in obscure fashion—on old cars and new—and poses a minor but nevertheless important engineering problem. What complicates the situation is the fact that there may be innu-

study is based upon the experiences of several outstanding motor car manufacturers as well as the notebook of the "engineering and service division" of U. S. Rubber Products, Inc., who have devoted considerable attention to the matter.

Among motor car engineers, and

CHARGES

in the modern cars come from a variety of sources that have opened several schools of thought among engineers

mobiles today are on the safe side so far as this level goes but, in a few cars, dry weather conditions will cause more static to be generated than can be dissipated.

A static charge can be dissipated in two ways; into the atmosphere or through the tires into the ground. Apparently most tires are sufficiently conducting to dissipate an electric charge to the ground if the ground contact is good, for it is known that the charge will disappear when the car is driven onto a wet section of road. It is evident that one controlling factor is the conductivity of the road surface. Cases have been reported of parked cars maintaining a charge, in dry weather, from 20 minutes to a half hour.

With reference to the foregoing, one of the motor car companies has found that certain types of road surface, typical example being a short stretch of Conant Road in Detroit, will produce a static charge in almost any car driven over it. This phenomenon has been observed and measured by using a spark gap attachment in which the potential has been found to vary from an air gap of $\frac{1}{8}$ inch to over $\frac{3}{8}$ inch. Incidentally, this type of road surface provides an excellent proving ground for evaluating the net effect of remedial procedures.

One of the motor car companies whose service department was faced with the problem of static charges on a maximum of perhaps 10 cars in a model year has made it a practice to eliminate every possible source of dry friction. On this make of car, they look for the following details:

Fan belts—replace, treat with mixture of graphite and glycerine;

Timing gear cover oil seal—treat with graphite;

Front propeller shaft seal—replace, treat with graphite;

Rear axle shaft seals—treat with graphite;

Tires—switch position on wheels, scrub interior thoroughly then rub in graphite, replace special tubes with standard.

This company has found that under-inflated tires may cause an excess of static due to abnormal flexing of side walls. On the other hand they find that a severe brake application will dissipate all static charge. Such random effects abetted by the effect of certain types of road surfaces, complicated further by the susceptibility of some people to even mild static charges, show why the

problem is so obscure and difficult of positive solution in the instances where it is observed and reported.

Some recent correspondence with Acheson Colloids Corp., indicates that several manufacturers of belting are treating rubber V-belts with a solution of "Oildag" (concentrated) and carbon tetrachloride to eliminate static charges and to impart greater lubricity. It is claimed that the several colloidal graphite products such as "Oildag" and "Aquadag" have the unique property inherent in colloids, of penetrating surfaces to which they are applied and becoming, so to speak, an integral part of the surface, thereby affording protection indefinitely.

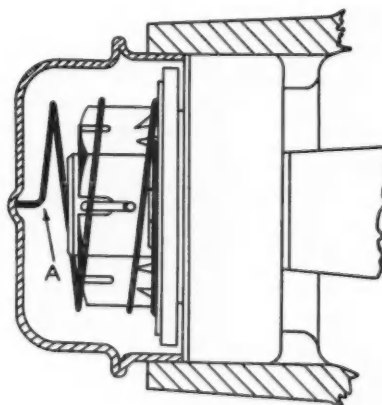
As to trouble shooting on chronic offenders, U. S. Rubber Products, Inc., offers some important suggestions to our readers:

Static Shocks

"If a shock is obtained from a car when there is rain or snow on the ground, the charge is *not* being generated by friction but comes from the high voltage circuits of the ignition or the radio. This can be remedied only by locating the offending wiring and correcting it.

"As a further means of identification, it should be determined whether the shocks are felt while inside the car. If they are, the static is probably caused by friction of clothing on the upholstery.

Front wheel static eliminator which discharges through the spring A to the hub, the wheel and thence to the ground



"The three principal 'static producers' which may produce static shocks are: the air flowing over the painted car body, friction between tires and the road, and friction between tires and inner tubes. Of the three, nothing is known about the relation of the first to the automobile, the second is a definite factor, but in all the tests to date, the last named item is the most important. In all cases, a *thorough* cleaning of the casing and the tube assembly (also the wheel rim) will produce a material reduction in static shock. This cleaning should be done first, with gasoline on a rag followed by a wiping with a wet rag. Use of powdered graphite lightly dusted on the tube is recommended.

"An obvious method to remove the static charge on a car is through a chain hanging from the chassis and touching the ground. This method can not be used when the car is equipped with a radio as the discharge at the end of the chain will produce radio interference to the extent that radio reception will be impossible. There are also indications that any metal suspended beneath the car will pick up such static as is discharging from tires and make matters worse."

Radio Static

"Radio interference should first be identified as due to a discharge of static electricity by the following simple test. Drive the car along a highway which produces a constant interference level in the radio—then decelerate the car rapidly by rather hard application of the foot brake. If the noise is eliminated when the brake pedal is pressed with a moderately hard pressure, the radio interference is undoubtedly due to a static discharge at the brake bands or between the tires and the ground.

"Static eliminators (now standard equipment in many automobiles) should be installed between the front wheel and spindle and between the rear axle housing and rear wheel, to insure a good wiping contact around the bearings which are usually insulated by an oil film. This should eliminate any discharge at the brake bands. If eliminators are already on the car they should be carefully checked to be sure they are not inoperative.

"If radio static persists, it is probably a static discharge to the ground at the rear of the tire contact and it may be of a periodic nature. If the periodicity can be removed, the interference in many cases falls below the level where it is

objectionable. Usually a few observations, while the car is in motion, will show whether the periodicity is synchronized with the revolution of the tires or the engine. If the latter is true, the fan belt should be treated with glycerine which will eliminate static generation at that point.

"If the above precautions do not eliminate the radio interference, the car owner must take recourse to a fish-pole type aerial which will reduce radio interference of the type just described."

With reference to the preceding paragraphs, it is a matter of interest that Olds Motor Works makes it a practice to supply front and rear wheel static collectors on cars equipped with radio. As illustrated, the front wheel static collector consists simply of a spring, while the rear wheel collector is composed of a brush and holder with the brush rotating on the grease slinger.

The front wheel collectors were installed in connection with the early radio applications, while the rear wheel collectors were adopted with the advent of under-running board aerials.

We may sum up the situation by noting that most complaints can be handled successfully by the methods discussed here, even though the static itself has not been eliminated. Experience indicates that car static problems are solved in the shortest time and with most satisfaction to the car owner if attacked cooperatively by car and tire engineers.

Finally may we note that the

phenomenon of car static has had but little space in the literature and it is hoped that this discussion will result in a further pooling of available experience in the interest of everyone concerned.

CHILTON ROUND TABLE

(Continued from page 346)

into shape in preparation for the law's effective date—October 23.

While recognizing that retailers as a general thing are to be exempted under the law, the former New York State Commissioner reports that out of all communications received from wholesalers to date, there are no indications that wholesale distributors expect to claim any exemption. He says that it is generally assumed that their business is interstate in character.

FROM

AUTOMOBILE TRADE JOURNAL

(Excerpt from a letter to ATJ written by Don Rose, Philadelphia Evening Ledger columnist)—
"There are millions of boys and many thousands of completely used cars in this country. They should get together. Crowbars, picks and hammers should be supplied by the Federal Government. In half an hour there would be millions of happy boys and no used car problem."

Diesel Oddities

(Continued from page 355)

time for the servicemen to get up, dress, gather their tools, and get to the job.

Increasing the number of overseers and profuse tongue-lashings and pep-talks failed to solve the problem. It all ended as quickly as it began, however, when one distracted representative took matters into his own hands. Methodically, he went from one tractor to another and sawed off the handles to the fuel tank shut-off valve. The results were steady performance for the machines and sighs of abuse from the drivers.

Shortly after peace had been established again, another levee problem presented itself. At that time the song "Old Man River" was very popular with the levee people, and with the negroes in particular.

The tractor Diesel had been provided with a throttle control, over-

riding the governor, which permitted very snappy and rapid acceleration of the engine. As the fuel lever was pulled quickly toward the driver, the exhaust would bark in a most pleasing staccato. The negro driver discovered that this was a very effective musical accompaniment, and he proceeded to sing "Old Man River" lustily to the punctuating and rhythmic orchestration of the gunning engine. This musical wave flowed up and down the river like an epidemic.

W. L. Day

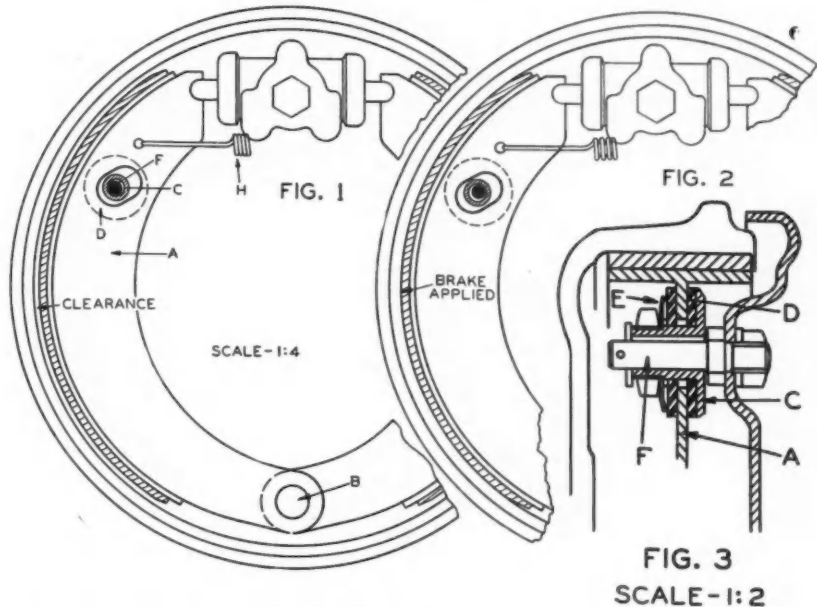
William LaMotte Day, former president and general manager of the General Motors Truck Co., died Sept. 6 in Ann Arbor, Mich., at the age of 75. He retired from business in 1924.

Mercedes Automatic Brake Adjustment

IN our report of the Berlin automobile show, in *AUTOMOTIVE INDUSTRIES* of March 26 last, mention was made of the fact that the Daimler-Benz Company in its type 230 car is now providing automatic means for compensating for the wear of brake linings, so as to keep the clearance between lining and drum constant. Some interest in the details of this system was expressed on the part of our readers and we requested the firm for further information, which it has kindly supplied us.

The mechanism employed is illustrated by the three sketches reproduced herewith. The brake shoe A is provided with an elongated hole concentric with the anchor pin B. The flanged sleeve C is provided with two friction discs D which are being pressed against opposite sides of the web of the brake shoe by the spring washer E. The friction between discs and web must be slightly greater than the force of the retraction spring H. The diameter of the stud F, which is mounted on the backing plate, is about 0.040 in. smaller than the bore of sleeve C.

When the driver presses on the brake pedal, the brake shoe A is



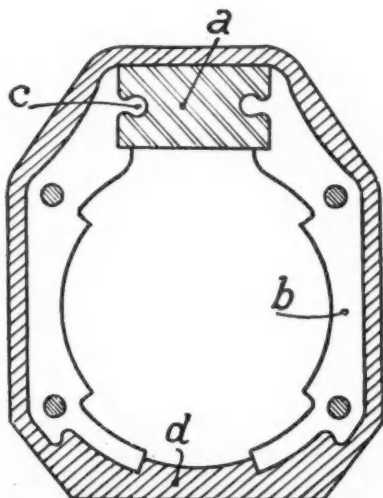
Details of Mercedes automatic brake adjustment.

pressed against the brake drum. If this results in wear of the brake lining, and sleeve C comes in contact with stud F as shown in Fig. 2, the brake shoe moves forward between the two friction discs, which accomplishes the adjustment.

When the brake pedal returns to

its position of rest, the retraction spring H withdraws the brake shoe A until the bushing C contacts with the stud F on the opposite side, as shown in Fig. 1. Owing to the clearance between sleeve and stud the clearance between brake shoe and brake drum is kept constant.

Permanent Magnet Material



THE introduction of new high-power permanent-magnet materials, such as Alnico, is likely to lead to considerable changes in the design of magnetos and other devices in which permanent magnets are employed. The accompanying drawing is from a French patent issued to the Robert Bosch Company for a magnetic field frame for electric generators and particularly for ignition magnetos. The field frame consists of a permanent magnet *a*

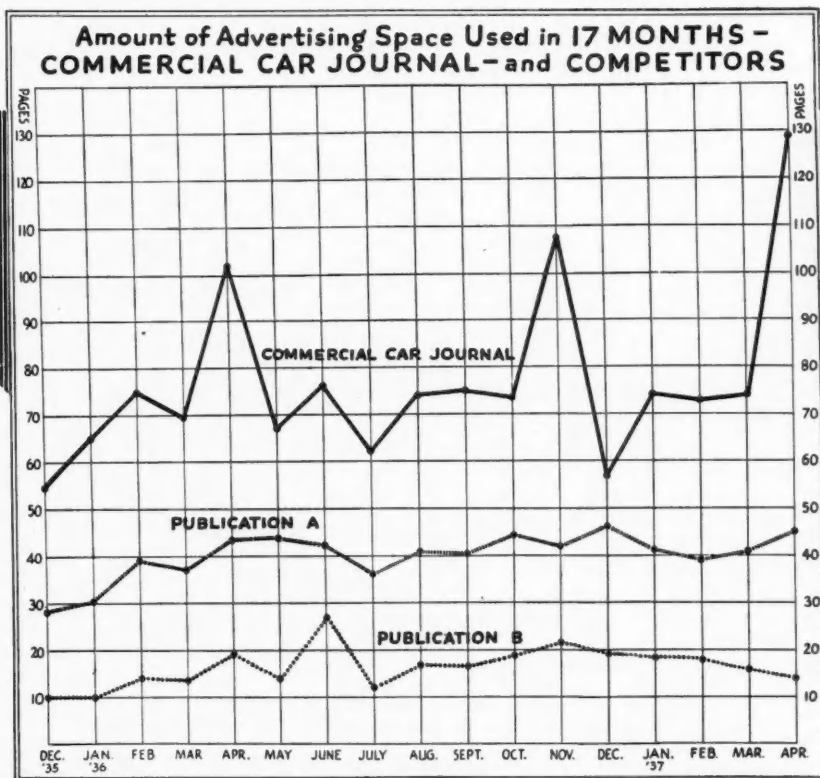
Field frame for magneto comprising a permanent magnet of a material of high coercive force.

and laminated pole pieces *b* which are connected to the ends of the permanent magnet and extend at right angles to the magnetic axis of the latter. The permanent magnet, which is made of an alloy steel of great coercive force, such as Alnico, whose magnetic qualities are not impaired at high temperatures, even at 1100 deg. Fahr. and higher, is cast around lugs *c* provided on the laminated pole pieces. Owing to the high coercive force, the permanent magnet is held quite short.

The magnetic field frame thus formed is surrounded by a housing *d* of non-magnetic material, such as aluminum, by casting. The advantages claimed for this novel method of building up magnetic field frames are that the field frame is very compact and that the manufacturing cost is low, as there is no machine work on the magnet.

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